THE BUTTERFLY GUIDE

A Pocket Manual for the
Ready Identification of the
Commoner Species Found in the
United States & Canada

BY W. J. HOLLAND, LL.D.

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A POCKET MANUAL FOR THE READY IDENTIFICATION OF THE COMMONER SPECIES FOUND IN THE UNITED STATES AND CANADA

BY

W. J. HOLLAND, LL.D.

Director of the Carnegie Museum
Author of "The Butterfly Book," "The Moth Book," etc.

With 295 Colored Figures
Representing 255 Species and Varieties

Garden City New York
DOUBLEDAY, PAGE & COMPANY
1916

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To the
BOY SCOUTS OF AMERICA
I dedicate
this Book
The Author

PREFACE

Recent advances in the arts make it possible to illustrate books at much less cost than formerly. An important invention is the process of printing in three colors from half-tone plates. The author of this manual was one of the first to use this process in illustrating a work upon the lepidoptera. When "The Butterfly Book" appeared he received letters from many scientific friends expressing their wonder. Among those who wrote to him was Dr. Samuel Hubbard Scudder, the Nestor among American lepidopterists, who has since passed away. He said: "I am simply astonished at the fidelity to nature displayed by the plates in your book, and at the low price at which the new process permits it to be sold."

That "The Butterfly Book" met a real need is shown by the fact that more than thirty thousand copies have already found purchasers. It is, however, a biggish book. The publishers, Messrs. Doubleday, Page & Co., have asked me to get up a little pocket manual of the butterflies, similar in form to the "Flower Guide," which has been most cordially received by the public. I have therefore prepared the following pages, to which in the gracious phrase of our forefathers I now "invite the attention of the gentle reader."

There are more than six hundred species of butterflies found in North America, north of the Gulf of Mexico and the Rio Grande. Most of these are figured in "The Butterfly Book." In this manual two hundred and fifty-five species and varieties are depicted in their natural colors. They are mainly the commoner forms, which occur in the more densely inhabited parts of the United States and Canada. I have, however, included numerous forms from the Southern States, and not a few of the more showy species from the Pacific Coast.

In some cases only half of the insect is shown. "Half a loaf is better than no bread." In some cases only one side of the wings is delineated. Usually this is sufficient for identification. The inhabitants of this earth have never seen but one side of the moon, but they know it when they see it, unless they be like the tipsy pair, one of whom said to the other, who was leaning against a lamp post, "Friend, is that the moon, or a lamp?" and who received the reply: "Don't ask me, I'm a stranger myself in these parts." By showing only one half, or one side, of a species I have been able to illustrate many more than I could otherwise have done.

The figures of some of the larger species have been slightly reduced to accommodate them to the page, but as the natural size is always given in the description the student need not be perplexed.

The author hopes that his readers will have as much pleasure in studying the winged fairies of the woods and the fields as he has had in preparing this small pocket guide for their assistance.

INTRODUCTORY

THE PLACE OF BUTTERFLIES IN THE ANIMAL KINGDOM

The Animal Kingdom is divided into various *subkingdoms.* One of these is the subkingdom of the *Arthropoda.* This word is derived from the Greek nouns ἄρθρον (*arthron*) meaning *joint*, and πούς (*pous*) meaning *foot.* The *Arthropoda* are animals the bodies of which are made up of a series of rings or segments jointed together, and the other organs of which are likewise composed of tubular bodies similarly united. All arthropods are *invertebrates;* that is to say, they do not have backbones and internal skeletons, such as are possessed by fishes, reptiles, birds, and mammals, including man. Vertebrate animals have *endoskeletons*, "inside skeletons." In a ham, for instance, the bone is internal to the muscular parts, or meat, and lies near the middle. The muscles of a man clothe his bones. In the arthropods, on the contrary, the hard parts clothe the muscles. Arthropods are therefore said to have *exoskeletons*, "outside skeletons." The body, the legs, and other organs of an insect or a crab consist of a series of hollow tubes held together by flexible skin at the points of union, and controlled in their movements by muscles which pull from the inside. The meat of a lobster is inside of the shell, or exo-

EXPLANATION OF PLATE A

Fig. a. *Magnified scales of butterflies.* 1, ordinary scale of *Papilio;* 2, do. of *Colias;* 3 *androconium*, or scale from wing of male *Neonympha eurytus;* 4, do. of male *Pieris, oleracea;* 5, do. of male *Lycæna pseudargiolus* (Figs. 1–2 after Verity; Figs. 3–5 after Scudder).

Fig. b. Patch of scales on wing of *Pieris napi* (after Verity).

Fig. c. Body of *Anosia plexippus.*

I. Head. 1, antenna; 2, eye; 3, proboscis; 4, palpus; cl. clypeus; o, occiput.

II. Thorax. 5, prothoracic leg; 6, mesothoracic leg; 7, metathoracic leg; e, e, e, episterna; c, c, c, coxæ; tr., tr., trochanters of last two legs; f, f, femora of do.; s, s, s, scuta of first, second, and third segments of thorax.

III. Abdomen. 1–9 segments; sp., sp., spiracles (after Burgess).

Fig. d. Head and legs of *Œneis semidea,* showing aborted front leg.

Fig. e. Palpus of *Argynnis aphrodite.*

Fig. f. Leg of *Argynnis idalia.* 1, coxa; 2, trochanter; 3, femur; 4, tibia; 5, tarsus.

Fig. g. Knobbed antenna of *Argynnis idalia.*

Fig. h. Clubbed antenna of *Basilarchia astyanax.*

Fig. i. Hooked antenna of *Amblyscirtes vialis.*

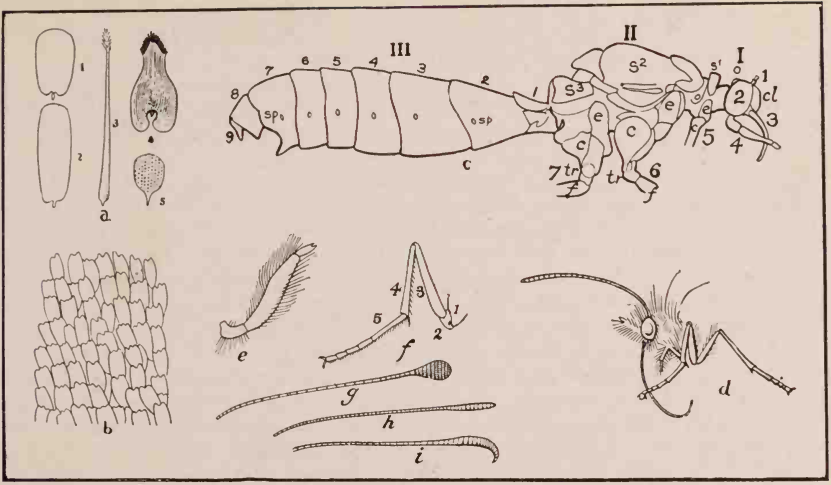
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PLATE A

skeleton, as everybody who has eaten a lobster knows. The arrangement is exactly the reverse of that which we find in the vertebrates.

The subkingdom of the *Arthropoda* is divided into six *classes*, one of which consists of the *Insecta* (insects). It is estimated that there are three and a half millions of species of insects upon the globe, not to speak of the vast number of species which are now extinct, and known only by their fossil remains.

The Class *Insecta* is subdivided into many *Orders*. To attempt even to briefly speak of all these orders would take more space than the publisher has allotted to the author, and it is enough to say that butterflies belong to the order *Lepidoptera*. The lepidoptera are divided into two *Suborders*: the *Rhopalocera*, or Butterflies, and the *Heterocera*, or Moths. Both are characterized by having scaly wings, hence the name, which is derived from the Greek words λεπὶς (*lepis*) meaning *scale*, and πτερὸν (*pteron*) meaning *wing*. Lepidoptera are "scale-winged insects." Any one who has ever handled a butterfly or moth, must have noticed upon his fingers a dust-like substance, rubbed off from the wings of the captured insect. Upon examining this substance under a microscope it is seen to be composed of minute scales (see Plate A, Fig. *a*), and upon looking at the wing of a butterfly under a magnifying glass it is seen to be covered with such scales, arranged somewhat as the scales upon the sides of a fish, or as the shingles upon the roof of a house (see Plate A, Fig. *b*).

Butterflies are mainly diurnal in their habits, preferring the sunshine. Moths on the other hand are nocturnal, and fly in the dusk, or after dark. Butterflies are therefore often called *diurnal lepidoptera*, and moths are spoken of as *nocturnal lepidoptera*. There are, however, a few butterflies which fly at dusk, and there are many moths which are diurnal in their habits. Such moths are generally gay in color, and for the most part inhabit tropical countries, although we have a few such species in the United States. Ordinarily the best way to distinguish between butterflies and moths is by examining their antennæ, or "feelers," as they are sometimes incorrectly called. In the case of butterflies the antennæ are thread-like, terminating in a small *knob-like*, or *club-like* enlargement. It is this fact which has led naturalists to call them *Rhopalocera*. The word is derived from the Greek nouns ῥώπαλον (*rhopalon*) meaning a *club*, and κέρας (*keras*) a *horn*. *Butterflies are lepidoptera having at the end of their antennæ clubs, which are sometimes short, long, or hooked* (see Plate A, Figs. *g*, *h*, *i*.) The forms assumed by the antennæ of moths are very various. The moths are therefore known as *Heterocera*, the word being compounded from the Greek adjective ἕτερος (*all sorts*) and the noun κέρας (*keras*) a *horn*. *Moths are lepidoptera having all sorts of antennæ, except such as are club-shaped at their ends.* However there is no rule without its exceptions, and there are a few rare moths in tropical lands which have club-shaped antennæ like butterflies, but none of these occur in the region with which this book deals.

The body of a butterfly consists of the head, the thorax, and the abdomen (see Plate A, Fig. *c*).

The head carries two relatively large eyes, one on either side. The eyes of insects are compound, and if examined under a microscope are seen to have a multitude of minute facets, which serve to gather the light from all directions, so that butterflies can look forward and backward, upward and downward, as well as outward, all at one time. Between the eyes on the upper part of the head arise the antennæ, of which we have already spoken. The precise function of these organs in insects has been the subject of much discussion. Supposed by some to be ears, by others to be the seat of the sense of smell, by others to combine within themselves these two senses, and by still others to represent a sense which is not possessed by vertebrate animals, their use in the life of insects is not yet clearly understood. The weight of evidence seems to be in favor of the view that they are organs of smell, and it is now quite firmly established by experiment that the organs of hearing in insects are represented by certain pores and openings on their legs. In front between the eyes and below the antennæ are two little organs, each composed of three joints, which are known as the *labial palpi* (see Plate A, Fig. *e*). Between these, coiled up like a watch-spring, is the proboscis, with which the butterfly sucks up the nectar from flowers or drinks water from moist places (see Plate A, Figs. *c* and *d*). We have not the space in this little manual to go more deeply into the anatomy of these organs, but enough has been said to enable the beginner to recognize the various parts. The student realizes that the head in general supports the principal organs of sense and the proboscis, or mouth.

The thorax carries the organs of locomotion, which consist of four wings and six feet. The thorax is made up of three segments, or rings, the foremost of which is called the *prothorax*, the next the *mesothorax*, and the hindmost the *metathorax*. The subdivisions of the thorax are not easily distinguishable by examining the body of a butterfly even under a microscope, because the bodies of butterflies are generally heavily clothed with hairs and scales. In order to clearly make out the subdivisions, which we are considering, it is necessary to take a specimen and denude it of its scales and hairs, and even dissect it under a glass. The correctness of the foregoing statements then becomes apparent.

The legs of butterflies are arranged in three pairs, the foremost of which are known as *prothoracic*, being attached to the prothorax; the second pair are called *mesothoracic*, springing, as they do, from the middle segment of the thorax; and the last are styled *metathoracic* legs, rising from the hindmost segment of the chest (see Plate A, Fig. *c*). It should be noted here that in the great family of the *Nymphalidæ*, or "Brush-footed Butterflies," in both sexes the anterior, or prothoracic pair of legs, are not fully developed, being aborted (see Plate A, Fig. *d*) and therefore do not serve for walking; and that in the families of the *Erycinidæ*, or "Metal-marks," and the *Lycænidæ*, or "Blues and Coppers," the females have six legs adapted to walking, while the males possess only four ambulatory legs, the front pair being in the latter sex aborted in these families, as in the *Nymphalidæ*. The legs of butterflies, like those of all other insects, consist of five parts (see Plate A, Fig. *f*) the first of which, nearest the body, is called the *coxa*, with which articulates a small ring-like piece, known as the *trochanter*. To the trochanter is attached the *femur*, and united with the latter, forming an angle with it, is the *tibia*. The last division of the leg is the *tarsus*, or foot, composed of a series of joints, to the last of which is attached a pair of claws, which in butterflies are generally rather minute, though in other orders of insects these claws are sometimes long and powerful, this being especially true of some beetles. The prothoracic legs of the *Nymphalidæ* and of the males of the *Erycinidæ* and *Lycænidæ* have lost the use of the tarsus, only retaining it in feeble form, and the tibia has undergone modification. In many of the *Nymphalidæ* the tibia is densely clothed with long hairs, giving this part of the leg the appearance of a brush, whence the name "Brush-footed Butterflies" (see Plate A, Fig. *d*). The tibiæ are often armed with more or less strongly developed spines.

The most striking parts of butterflies are their wings, which in proportion to the size of their bodies are usually very large, and which are remarkable for the beauty of the colors and the markings which they display both on the upper and on the under side.

The wings consist of a framework of horny tubes which are in reality double, the inner tube being filled with air, the outer tube with blood. The blood of insects is not, like that of vertebrates, red in color. It is almost colorless, or at most slightly stained with yellow. The circulation of the blood in the outer wall of the wing-tubes takes place most freely during the brief period in which the insect is expanding its wings after emergence from the chrysalis, concerning which we shall have more to say elsewhere. After the wings of the butterfly have become fully expanded, the circulation of the blood in the wings ceases almost entirely. The horny tubes, which compose the framework of the wings of butterflies, support between them a delicate membrane, to which upon both the upper and lower sides are attached the scales. The two fore wings are more or less triangular in outline; the hind wings are also subtriangular, but are generally more or less rounded on the outer margin, and in numerous forms are provided with tails or tail-like prolongations.

Inasmuch as in describing butterflies authors generally devote a good deal of attention to the markings of the wings, it is important for the student to become acquainted with the terms employed in designating the different parts of the wings (see Plate B, Fig. 10). That part of the wing which is nearest to the thorax, is called the *base;* the middle third of the wing is known as the *median* or *discal area;* the outer third as the *external* or *limbal area*. The anterior margin of the wing is called the *costal margin;* the outer edge is styled the *external margin;* the inner edge is known as the *inner margin*. The tip of the front wing is called the *apex*, which may be rounded, acute, falcate (sickle-shaped), or square (see Plate B, Figs. 1–4). The angle formed by the outer margin of the front wing with the inner margin is commonly known as the *outer angle*. The corresponding angle on the hind wing is known as the *anal angle*, and the point of the hind wing, which corresponds with the tip or apex of the fore wing, is designated as the *external angle*. The margins of wings may have different styles of outline, and are spoken of as entire, crenulate, scalloped, waved, lobed, or tailed (see Plate B, Figs. 5–8).

A knowledge of the veins which form the framework of the wings is important, because authors have frequently established genera upon the basis of the wing structure. It is desirable on this account to understand the nomenclature which has been applied to the veins. This nomenclature is somewhat variant, different writers having employed different terms to designate the same vein. In what follows the writer has adopted the designations which are most current, and which are generally accepted by authors. The best understanding of this matter is to be derived from the attentive study of the diagrams given on Plate B, Figs. 9 and 10.

The veins in both the fore and hind wings of butterflies may be divided into simple and compound veins. In the fore wing the simple veins are the *costal*, the *radials*, the *submedian*, and the *internal;* in the hind wing they are the *costal*, the *subcostal*, the *radials*, the *submedian*, and the *internal*. The costal vein in the hind wing is, however, generally provided near the base with a short ascending branch, which is known as the *precostal* vein. In addition to the simple veins there are in the fore wing two branching veins, one immediately following the costal, known as the *subcostal*, and the other preceding the submedian, known as the *median*. The branches of these compound veins are known as *nervules*. The median vein always has three nervules. The nervules of the subcostal veins branch upwardly and outwardly toward the costal margin and the apex of the fore wing. There are always from four to five *subcostal nervules*, variously arranged. In the hind wing the subcostal is simple. The median vein in the hind wing has three nervules, as in the fore wing. In both wings between the subcostal and the median veins toward the base is enclosed the *cell*, which may be either *closed* or wholly or partially *open* at its outer extremity. The veinlets which close the cell are known as the *discocellular veins*, of which there are normally three. From the point of union of these discocellular veins go forth the *radials*, known respectively as *upper* and *lower*, though the upper radial in many genera is emitted from the lower margin of the subcostal vein.

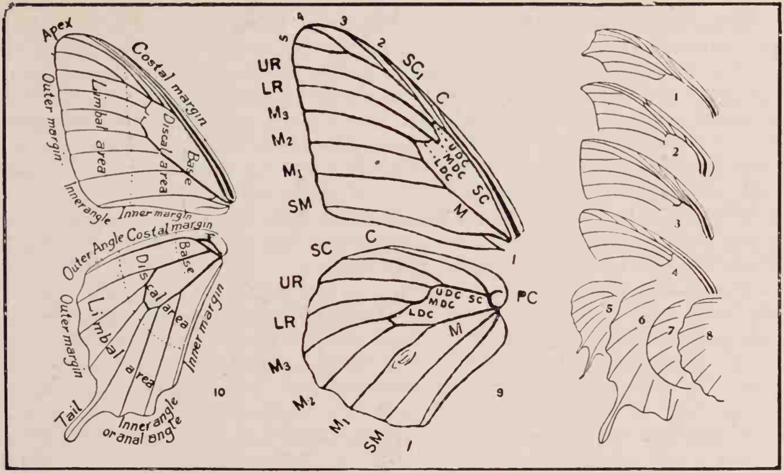
EXPLANATION OF PLATE B

Fig. 1. *Angulated* or *acuminate apex* of fore wing (*Grapta*).
Fig. 2. *Falcate apex* of fore wing (*Pyrrhanœa*).
Fig. 3. *Square apex* of fore wing (*Smyrna*).
Fig. 4. *Rounded apex* of fore wing (*Euptoieta*).
Fig. 5. Hind wing *rounded at outer angle, twice-tailed* (*Thecla*).
Fig. 6. Hind wing *crenulate, tailed, lobed at anal angle* (*Papilio*).
Fig. 7. Hind wing with *outer margin entire* (*Parnassius*).
Fig. 8. Hind wing with *outer margin waved* (*Argynnis*).
Fig. 9. Neuration of wings of *Anosia plexippus*.

Veins: C, costal; SC, subcostal; M, median; SM, submedian; I, internal; PC, precostal; UDC, upper discocellular; MDC, middle discocellular; LDC, lower discocellular; UR, upper radial; LR, lower radial.

Nervules: SC 1, 2, 3, 4, 5, first to fifth subcostal nervules; M 1, 2, 3, first to third median nervules.

Fig. 10. Wing of *Papilio turnus*, showing the names given to the different parts of the wings of butterflies.


Apex
Costal margin
Outer margin
Limbal area
Discal area
Base
Innerangle
Inner margin
Outer Angle
Costal margin
Base
Discal area
Outer margin
Limbal area
Inner margin
Tail
Inner angle or anal angle
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3
5
2
SC1
UR
LR
C
M3
M2
UDC
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PLATE B

Butterflies generally hold their wings erect when they are at rest, with their upper surfaces facing each other, and only the under surfaces displaying their colors to the eye. In the genus *Ageronia* the insect prefers, like some moths, to settle upon the bark of trees, with the wings spread flat, and the head pointing downward. Many of the *Hesperiidæ*, or "Skippers," have the habit when they are at rest of holding the fore wings folded together, while the hind wings are expanded horizontally. Many of the butterflies known as "Hair-streaks," belonging to the genus *Thecla* and its allies, have the curious habit, when at rest upon the end of a twig or leaf, of moving their folded wings backward and forward, first on one side and then on the other, thus partially displaying with each movement the splendid blue surfaces of the upper side of the wings.

The abdomen of butterflies consists normally of nine segments (see Plate A, Fig. *c*). In most butterflies except the Ithomiids, the end of the abdomen does not extend beyond the anal angle of the hind wings. In the moths, on the other hand, there are multitudes of genera in which the extremity of the abdomen extends far beyond the hind margin of the posterior wings. This is particularly true of the hawk-moths. A minute examination of the abdomen of a butterfly reveals in each segment except the last a little valve-like orifice on either side. These openings are known as *spiracles* (see Plate A, Fig. *c*). Through these the insect breathes. Insects do not breathe through their mouths, like vertebrates, and their lungs, or what correspond to the lungs of the higher animals, are not located in the thorax or chest, but in the abdomen. The last segment of the abdomen carries at its extremity the external organs of generation. The male may be distinguished from the female by the so-called *prehensores*, or "claspers," two flattish, scale-like appendages which adhere one on either side to the last segment of the body. These organs are quite peculiar in their structure, and in recent years have received a great deal of study, as it has been found possible by means of them to distinguish closely allied species, especially among the *Hesperiidæ*. It is, however, not possible within our allotted space to go into a minute discussion of this matter. The abdomen of the female is devoid of these appendages, and in this sex is generally heavier and plumper, especially when the eggs, which fill the ovaries, have not as yet been deposited.

Thus far we have devoted our attention almost exclusively to the consideration of the external organs of the suborder of insects which is under discussion. It may be of interest to devote a few paragraphs to the internal anatomy of butterflies. To do the subject full justice would require a volume; nevertheless some general statements may pave the way for a more studious inquiry on the part of readers.

Butterflies take their nourishment in fluid form, principally from the cups which Flora provides. The organ of ingestion is the proboscis, which communicates with a bulb-like receptacle in the head, known as the pharyngeal sac, controlled by a set of muscles which cause it to alternately expand and contract, very much like the bulb-syringe used by physicians. When the muscles expand a vacuum is created, and the fluid is drawn up from the honeyed chalice of the flower into the receptacle in the head; when they contract, a valve in front closes, a valve behind opens, and the honey in the receptacle is forced backward through the œsophagus into the crop, and thence into the stomach. The stomach lies on the ventral or under side of the body, but above the nervous cord, which lies still more ventrad. The stomach opens posteriorly into the small intestine, which is followed by the colon, the latter in turn being succeeded by the rectum. Connected with the intestines are certain vesicles, which are known as Malpighian vessels, and by some are thought to have the function of the liver in higher animals.

Having thus briefly spoken of the nutritive system we may turn to the circulatory and respiratory systems. The heart of a butterfly, as in all arthropods, lies on the dorsal side of the body. Its location corresponds almost exactly to that occupied in the vertebrate animals by the spinal cord. It is a long tubular organ. It does not possess chambers—ventricles and auricles—such as are discovered in the heart of vertebrates, but it has an enlargement in the mesothoracic region known as the aortal chamber. The movement of the heart is wave-like, analogous to the peristaltic movement in the intestines of the vertebrates. From the heart there go out lateral blood-vessels, which ramify and intermingle with the capillary extremities of the tracheæ, or bronchial tubes, through which air is imported by way of the spiracles, and thus the blood is purified in a manner quite analogous to that in which the blood of the higher vertebrates is purified and freed from waste matter by oxydization. The process is, however, as has already been pointed out, mainly carried on in the abdominal region, and not exclusively in the thorax, as in the case of vertebrates.

The nervous system of butterflies consists of a cord with *ganglia*, or nerve-knots, one for each segment of the body. As there are thirteen segments in the body of a butterfly, there are normally thirteen such ganglia, or nerve centres. The nervous cord lies in a position exactly opposite to that which is held by the spinal cord in vertebrates. It is situated on the ventral side of the body, and more ventrad than all the other internal organs. The ganglion in the head is the largest of all and forms a rudimentary brain, the greater portion of which consists of two relatively large optic nerves.

The internal organs of reproduction in the female consist of the ovaries, from which the eggs pass by way of the oviduct to the ovipositor, which in butterflies is not so conspicuous or remarkable an organ as is the case in many other insects. Communicating with the oviduct are the spermatothecæ, which are receptacles in which is retained the fertilizing fluid received from the male at the time of coition. As the eggs, one by one, are passed from the ovaries into the oviduct, they are impregnated through absorption of the spermatozoa, which enter their walls, imparting to them vitality. The internal organs of the male are tubular vesicles, or testes, which secrete the seminal fluid, which by means of the intromittent organ is introduced into the spermatothecæ of the female. Union between the sexes among insects generally takes place but once, and is not recurrent. The female, having been impregnated, proceeds at once to lay her eggs upon the tender leaves or the bark of the plants upon which her progeny are to be nourished, and then promptly dies. The life of insects in the winged form is usually very brief. Inasmuch as there are great differences between the sexes in insects alike in size, form, color, and markings, it is well for the collector to carefully preserve specimens which may be captured in copulation. Such specimens should be designated as "Taken *in coitu*." The writer in such cases uses the formula "A ♂ *in coitu* with B ♀," which is put in minute handwriting upon a label and placed upon the pin bearing the male insect. Upon the pin carrying the female insect there is put the label "B ♀ *in coitu* with A ♂." The finding of insects *in copula* is sometimes the only way in which to definitely settle the question of sexual relationship between forms. So different are some insects that the two sexes have in a number of cases been described by early writers as belonging not merely to different species, but to different genera, and even families.

THE LIFE HISTORY OF BUTTERFLIES

Almost all insects undergo great changes, or metamorphoses, during their existence. Butterflies furnish no exception to this statement. They exist first as *eggs;* then they appear as *caterpillars;* the third stage is that of the *chrysalis;* the final stage is that of the *imago*, or perfectly developed insect.

THE EGGS OF BUTTERFLIES

The eggs of butterflies are beautiful objects when examined under a glass. They have various forms. Some are spheres or half spheres, some are conical, cylindrical or spindle-shaped, others are flat and resemble little cheeses, and still others have the form of turbans. There is endless variety of form displayed within certain limits. Their surfaces may be quite smooth or they may be adorned with raised ribs and sculpturings (see Plate C, Figs. *f* and *g*) or marked with little pittings or depressions arranged in geometrical patterns. They vary in color. Some are white, some pale green, or blue-green; others are yellow, orange, red, or purple. They are often spotted and marbled like the eggs of some birds.

The eggs of butterflies are deposited by the female upon the plants which are appropriate to the development of the larvæ. Caterpillars are very rarely promiscuous feeders, and most species are restricted to certain species or genera of plants. Even when they feed upon different plants, observation shows that, having begun to feed upon a certain plant, they prefer this to all others, and do not willingly accept anything else. I have noticed frequently that larvæ which may for instance feed in nature upon the wild plum or the lilac, having begun to feed upon the one will steadily refuse the other if offered to them. On several occasions I have lost broods of caterpillars by attempting to change their diet, though knowing well that the species is found feeding in nature upon the plants which I have offered to them. Almost every plant has a butterfly or moth which is partial to it, and one of the most wonderful things in nature is the way in which the female butterfly, without having received a botanical education, is able to select the plant which will best meet the needs of her progeny, which she never lives to see.

The eggs are deposited sometimes singly, sometimes in small clusters, sometimes in a mass. Fertile eggs, soon after they have been laid, undergo a change in color, and it is then possible with a magnifying glass to see through the thin shell the form of the caterpillar which is being developed within.

When the development is completed the caterpillar emerges either from an opening at the side or at the top of the egg. Many species have eggs provided with a sort of lid, a portion of the shell being separated from the remainder by a thin section, which finally breaks under the pressure of the enlarging embryo within, this portion flying off, the rest adhering to the twig or leaf upon which it has been placed. Many larvæ have the habit, as soon as they have emerged from the egg, of making their first meal upon the shell from which they have just escaped.

CATERPILLARS

The second stage in which the insects we are studying exist is known as the *larval stage*. When it is reached the insect is spoken of as a *larva*, or *caterpillar* (see Plate C, Fig. *h*). Caterpillars have long, worm-like bodies, which are often thickest about the middle, tapering before and behind, and more or less flattened on the under side. Sometimes caterpillars are oval or slug-shaped. Very frequently their bodies are adorned with hairs, spines, and tubercles of various forms. The body of the larva, like the body of the butterfly, consists normally of thirteen rings or segments, of which the three foremost, just behind the head, correspond to the prothorax, the mesothorax, and the metathorax of the perfect insect, while the remaining nine correspond to the abdomen of the imago. These three anterior segments bear legs, which correspond to the legs of the winged form in their location, and are known as the true legs of the larva. Besides these the caterpillar has about the middle of the body and at its posterior end paired *pro-legs*, as they are called, which are its principal organs of locomotion in this stage, but which do not reappear

EXPLANATION OF PLATE C

Fig. a. Caterpillar of *Anosia plexippus* ready to change into a chrysalis.

Fig. b. Do. after having partly shed its skin.

Fig. c. Do. holding itself suspended in the air by grasping the shed skin between the edges of the third and fourth abdominal segments, and feeling about with the cremaster for the button of silk above.

Fig. d. Do. after having caught the button and assumed its final form as a chrysalis.

Fig. e. Chrysalis of *Papilio philenor,* held by button and girdle of silk.

Fig. f. Egg of *Basilarchia disippus,* greatly magnified.

Fig. g. Egg of *Anosia plexippus,* greatly magnified.

Fig. h. Caterpillar of *Basilarchia disippus.*

(All the figures are after Riley.)

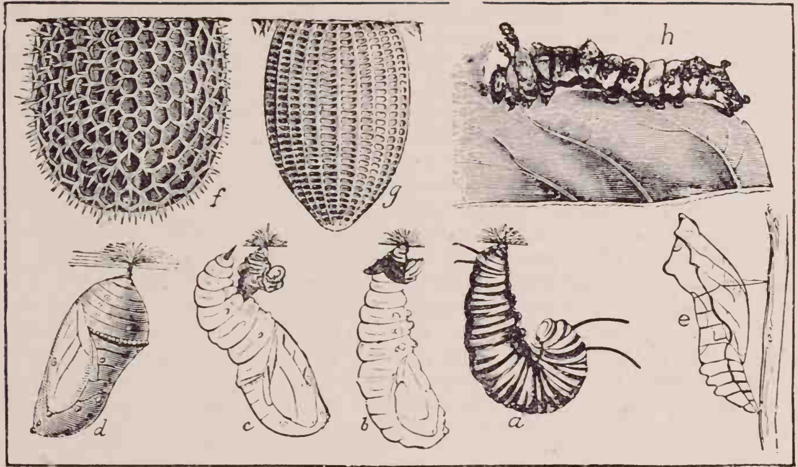


PLATE C

in the butterfly. The mouth parts of caterpillars are profoundly different from those of the butterfly. The imago lives, as we have seen, upon fluid nourishment, and therefore is provided with a sucking organ, the proboscis. The caterpillar, on the other hand, is armed with a pair of cutting mandibles, with which it shears off tiny strips of the leaves upon which it feeds. It holds the edge of the leaf in place with the three pairs of true legs, while it supports its body upon the pro-legs during the act of eating.

When the caterpillar emerges from the egg the head is in many cases seen to be very large in proportion to the rest of the body. This relative disparity soon disappears, however, as growth takes place. As the larva increases in size, it soon reaches a point at which the skin in which it made its appearance in the world becomes too small and tight for further comfort and use. Thereupon it proceeds to moult, or shed, this now uncomfortable garment. The skin splits along the back and the caterpillar crawls out of it. Before moulting the caterpillar always takes the precaution to attach this outer skin by strands of silk to the leaf or branch upon which the moult is to take place. Having escaped from the cast-off garment, the caterpillar sometimes turns around and eats it before resuming its vegetable diet. The process of moulting takes place four or five times before the larva changes into a chrysalis.

Caterpillars differ entirely from butterflies in that they are able to produce silk. Silk is a viscous fluid secreted by elongated sacs located in the dorsal region. These sacs communicate with a minute tube-like organ, known as the spinneret, which is located on the under side of the head of the caterpillar, just back of the mandibles. The fluid silk, as it is ejected through the spinneret, immediately hardens on contact with the air and is deposited in the form of very fine threads or filaments which the caterpillar uses for various purposes, sometimes as lines with which to guide itself from place to place and enable it to retrace its steps to its favorite resting-place, sometimes to tie together the leaves in which it forms its nest, or to weave a sort of shelter in which it conceals itself, and finally to make the little buttons and the girdles by which, as we shall see later, the chrysalis is held in place. Many moths weave from silk compact structures known as cocoons, in which the chrysalis is lodged. Butterflies do not weave true cocoons.

The time spent by the insect in the egg is generally short. The time passed in the larval state may be short or long. When butterflies hibernate, or pass the winter, as caterpillars, the time spent in this state is long, and especially in the case of those species which inhabit arctic regions. There are some butterflies which occur north of the Arctic Circle, and we have ascertained that these, because the summers are so short in the far north, pass two summers and the intervening winter in the larval condition, and another winter in the pupal stage, before they emerge and take wing. On the other hand, under more temperate conditions butterflies of certain species may produce two or even three broods in a summer, and in subtropical or tropical lands there may be even more broods produced.

While it is true that almost all the larvæ of lepidoptera subsist upon vegetable food, there are nevertheless exceptions, one of which is that of the Harvester, *Feniseca tarquinius* (see Plate LXXXVIII, Fig. 1), the slug-like larva of which feeds upon scale-insects, or mealy bugs, sharing the habit with certain allied species which occur in Africa and Asia, as the writer has had occasion to point out a number of years ago in certain of his writings.

THE PUPA, OR CHRYSALIS

The third stage in the life of lepidoptera is known as the pupal stage. The caterpillar, having undergone successive moults and reached maturity, is transformed into a pupa, or chrysalis (see Plate C, Figs. *d* and *e*). From having been an active, worm-like creature, greedily feeding upon its appropriate food, it reverts to a form which is stationary, as was the egg, and ceases to have the power of locomotion. An examination of the structure of all chrysalids shows that they contain an immature butterfly. The segments of the chrysalids enclose the corresponding segments of the body of the butterfly, and in sheathing plates of chitinous matter are enfolded the wings and all the other organs which are necessary to the life of the butterfly when it shall have emerged and taken wing. The act of transformation from the caterpillar stage to the pupal stage is very wonderful. The caterpillar makes provision for the great change by weaving a little button of silk and, in the case of many of those larvæ, the chrysalids of which are not pendant, by also weaving a little girdle of silk, which it passes around its back, and which holds it in place very much as an Indian baby is held by the strap which passes over the shoulders of the squaw (see Plate C, Fig. *e*). Having made these preliminary arrangements the caterpillar becomes very quiet, its hind pro-legs being securely hooked and tangled into the silken button to which it is attached. After a while, when the proper moment has arrived, the skin of the caterpillar splits, just as in the moults which preceded, and by a series of wriggling or vibratory motions the chrysalis succeeds in working off the skin of the caterpillar until it has all been shed except where near the end of the abdomen the skin is caught between the edges of two of the horny rings which form the abdomen. Then the insect with the *cremaster*, as it is called, a little spikelet at the very tip of the chrysalis, which is armed with small hooks, proceeds to feel about until these hooks become entangled in the silk of the button which has been provided on the under surface of the twig, the stone, or the fence rail, where the transformation is occurring. As soon as the chrysalis is securely hooked into the button of silk it lets go of the little section of the skin by which it has been supported and rapidly assumes the shape in which it will remain until the time of its emergence as a butterfly. These changes are illustrated on Plate C, Figs *a–d*, which are reproduced from "The Butterfly Book" after the drawings of the late Prof. C. V. Riley. The chrysalids of all the Nymphalidæ are pendant; those of the other families, except the Hesperiidæ, are provided with girdles, as is shown on Plate C, in the figures which represent the chrysalis of *Papilio philenor*. The chrysalids of the Hesperiidæ, like the chrysalids of moths, are either formed in loosely woven coverings of leaves tacked together with silken threads, or lie free under leaves and rubbish upon the ground, thus resembling the chrysalids of moths.

Chrysalids are for the most part rather obscure in coloring, though some are quite brilliantly marked with metallic spots as in the case of the common Milkweed Butterfly, *Anosia plexippus*, the chrysalis of which is pearly green in color, ornamented with bright golden spots.

The forms assumed by chrysalids are very various, especially among the Nymphalidæ, and they are often ornamented with curious projections and tubercles, imparting to them very odd outlines.

Some butterflies remain in the chrysalis stage for only a few days or weeks; others pass the winter in this state, and this is true of many of the species which are found in the colder parts of North America. In temperate regions some butterflies have as many as three broods: the spring brood, which comes forth from chrysalids which have over-wintered, an early summer brood, and a fall brood. In tropical countries many species retain the form of the chrysalis during the dry season, and emerge upon the wing at the beginning of the rainy season, when vegetation is refreshed and new and tender growths take place in the forests.

THE IMAGO, OR WINGED INSECT

We have already spoken at length of the form and structure of butterflies in the preceding paragraphs, which were devoted to the anatomy of butterflies. It remains for us at this point to call attention to the manner in which the butterfly undergoes transformation from the chrysalis. This change is quite as interesting as that which takes place when the caterpillar is transformed into the pupa; and should any of my readers possess chrysalids I would advise them to watch carefully and observe the curious events which follow one another rapidly when the imago comes forth from the cerements of the chrysalis. The coverings which ensheathe the head, the legs, and the antennæ split, the head protrudes, the fore legs are disentangled and are thrown forth, followed almost at once by the other legs, and the insect proceeds to crawl out from the pupal skin, emerging with the wings as miniature objects, the body trailing after as a long worm-like mass. Having liberated itself from the sheathings of the chrysalis, the insect immediately assumes a sta-

EXPLANATION OF PLATE D

Fig. 1. Illustration showing the way to disable a butterfly in the net by gently pinching the body where the wings come together.

Fig. 2. A butterfly net.

Fig. 3. *a*, hoop made of wire, the shanks tied together; *b*, ferrule, plugged at *c* with a piece of cork; the shanks having been put into the top of the ferrule, melted solder is poured into the top, and a good net-ring is made.

Fig. 4. Piece of paper used to cover cyanide at bottom of jar.

Fig. 5. Collecting jar, with lumps of cyanide and sawdust at bottom, covered by paper, as shown in Fig. 4.

Fig. 6. Expanding block, used to expand and mount insects, the wings of which have a tendency to droop or sink down.

Fig. 7. Expanding block, used to mount insects, the wings of which have a tendency to rise up or close.

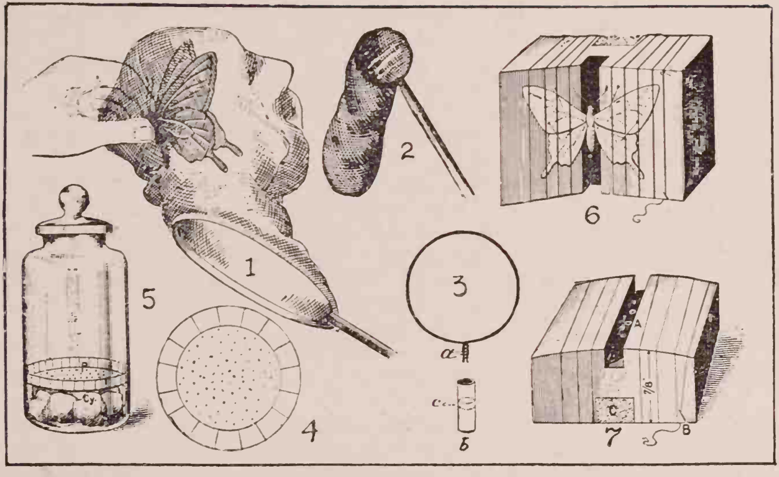


PLATE D

tionary position, head upward, body hanging downward. Then by the action of the heart the fluids which fill the body begin to be rapidly sent into circulation, more particularly into the wings, which expand second after second, minute after minute, the fluids in the body being transferred through the circulatory system of the wings until the latter, hanging downward, have assumed their full form. The insect then begins gently to move its wings, to fan them, still remaining in the position which it first took. After a while the wings become perfectly dry, and the long worm-like body has shrunk up and has assumed the form which it will retain through the subsequent life of the insect. Madame Butterfly then begins to change her position. She carefully crawls a few steps to try her powers of locomotion. She suddenly expands her wings, and, *presto!* if you alarm her, she is off, fluttering about the cage in which you may have her, or darting forth into the room and through the open window, hieing herself forth in quest of food, which awaits her in the honeyed cups of the wild flowers.

COLLECTING BUTTERFLIES

In collecting butterflies the first thing is to get a net of some kind with which to catch the insects without tearing their delicate wings, and thus robbing them of their beauty (see Plate D, Figs. 1 and 2). When I was a boy I made my own nets.

I took a stick of tough wood about four feet long, which was to serve as the handle. About seven or eight inches from the upper end I wrapped it with copper wire; fishing line will do as well. Then I split the stick down to the band I had made around it. I then with my knife trimmed the two split portions on their inner sides, so that they might be more flexible. I then fashioned out of a piece of good green hickory (the white outer wood must be used) a bow or hoop about twelve inches wide at its widest part, and fitting this between the split ends of the stick put in a wedge at the bottom of the cleft to keep the split ends well apart and tied it neatly and securely in place. Upon the frame made in this way I put a covering of green mosquito netting in the form of a long bag. Many a fine insect I captured with this simple device, which called only for a good jack-knife, a little ingenuity, ordinary skill in whittling, and a supply of stout string. The cheapest and simplest way to make the frame for a net is to take a long piece of brass, aluminium, or galvanized iron wire about an eighth of an inch in diameter and bend it into a circle, leaving two short shanks at the end. Then fit the shanks into the top of the ferrule of a fishing-rod plugged in the middle with a thin piece of cork or with clay, and pour in melted solder. Plate D, Fig. 3 shows how the "trick" is done.

There are many devices for making frames for folding nets, and there are a number of dealers in the United States who supply such nets at moderate prices. The material for the bag of the net ought to be of light stuff, and I prefer to use tarletan, preferably green in color, or bobbinet. The latter is more durable though somewhat heavier than tarletan. The bag of the net ought to be about three times as long as the diameter of the ring upon which it is placed. It is well, after the net has been sewed upon the ring, to cover it with a band of stout dark-colored muslin, as otherwise the edge of the bag surrounding the ring is apt to become speedily worn and torn.

The collector having provided himself with a net for capturing insects must also provide himself with one or more collecting jars. It is well to have several of these of a size convenient for carrying in the pockets. For large specimens a larger jar is required; for small specimens a smaller receptacle is better. The larger jar should have the mouth about two and one half or three inches in diameter. Wide-mouthed glass phials an inch and a half in diameter serve best for the smaller receptacles. The stopper of the larger jar should be of ground glass, of the smaller jar of good cork. Jelly tumblers or glasses with tin tops make good collecting jars. In preparing the jar for use place a few lumps of cyanide of potash about the size of a filbert at the bottom; then put in a little clean sawdust to keep the pieces of cyanide from rattling about; over the lumps of cyanide paste a sheet of strong white paper perforated with a multitude of holes. In doing this the writer has resorted to a simple method, which is explained in the diagram on Plate D, Fig. 4. A piece of paper is placed under the jar and a circle the size of the inside of the jar is traced upon it. Then a disk is cut out about three quarters of an inch greater in diameter than the original circle. The paper is punctured over the entire surface included within the inner line, and then with scissors little gashes are made from the outer circumference inward, so as to permit of folding the edge of the disk inwardly. A little gum tragacanth, or paste, is then applied to these upturned edges, the disk is then inserted into the jar and pasted securely over the cyanide by means of the upturned flaps. A jar thus charged will last for a long time if kept stoppered when not in use. Cyanide has a tendency to liquefy in the presence of moisture, and it is well therefore to take care to keep the jar closed when not in use. It must, however, be borne in mind that the fumes of hydrocyanic acid (prussic acid), which are active in producing the death of the insect, will not be given off in sufficient volume unless there is a small amount of moisture in the jar, and in very dry climates the writer has sometimes found it necessary to moisten the bottom of the jar with a drop or two of water. Jars also may be charged with lumps of carbonate of ammonia, but as this substance bleaches the wings of insects, especially those which are green in color, its use is not strongly recommended. Figure 5 on Plate D shows a jar prepared for use.

When a butterfly has been caught in the net it is apt to flutter about and struggle violently, thus injuring its wings. It is well therefore as soon as the insect has been captured to take hold of it at the point where the wings join the body.

while it is still in the net, and by gently pinching the thorax to disable the insect. The fingers are applied from the outside, as shown in the illustration (see Plate D, Fig. 1). Then the collector, unstoppering his jar, inserts it into the net and allows the butterfly to drop into the jar. Butterflies belonging to the family of the *Hesperiidæ*, or "skippers," are best captured in the net by holding up the end of the bag. The insects will then fly upward and settle near the top of the bag. The collector puts the open jar with his right hand into the ring of the net and holding the bag with the left hand brings the jar under the butterfly, and then claps his left hand over the mouth of the jar, thus securing the insect in the jar, where after a couple of seconds it will be stunned by the fumes and fall to the bottom. Death is speedy, but not instantaneous, and the insect should be allowed to remain a little while in the jar. Having been asphyxiated by the fumes of the jar, the insect may then be removed and either mounted upon a pin and transferred to a collecting box, which will presently be described, or put into an envelope. It is well not to accumulate too many insects in the collecting jar, as those which are caught later will injure in their struggles those which have been caught first. I make it a rule to rapidly transfer the insects from the collecting jars to the collecting boxes which I carry with me. The preservation of specimens in perfect freshness, without torn or ragged wings, is of the utmost importance, and it is better to take fewer specimens, preserving them in immaculate condition, than to accumulate a quantity of ragged and battered examples. The old adage, "Practice makes perfect," applies in the use of the net and the poisoning jar. There will necessarily be some failures on the part of the young collector at the outset, but if he is neat and quick of finger he will soon acquire the art of taking and preserving perfect specimens.

The field box should be made of tin and should have a sheet of cork securely fastened at the bottom. In one corner of the box, tied in gauze and securely fixed in place, there should be a few lumps of cyanide. Into this box the specimens should be pinned as they are taken from the collecting jar, and the lid of this box should be kept tightly closed most of the time, being opened only when the transfer of the pinned specimens to the interior of the box is ready to be made. Inasmuch as pinning insects on the field is not always satisfactorily accomplished, the writer prefers not to pin them, but to carry with him a supply of small pay-roll envelopes, into which the insects are put, and these envelopes are then put into a box which has some cyanide secured in it, as has already been described. The writer also carries with him a little phial of chloroform in his vest pocket, and he sometimes uses this to stun insects or puts a few drops into the collecting box and then closes it. The objection to the use of chloroform is that it induces spasms of the thoracic muscles, and butterflies killed by the use of chloroform are not nearly so easily mounted as specimens which have been killed with cyanide. Beetles, wasps, and other hard-bodied insects should not be put into the same coliecting jars as those which are used for butterflies, as they are very apt to injure the latter, tearing and spoiling the wings. If the collector is engaged in taking other insects besides butterflies and moths, he should have special jars in which to put the beetles and other hard-bodied and spiny things.

If the collector does not wish immediately to mount his specimens, but to preserve them for mounting at a future time, they may be left in the envelopes of which I have spoken, or may be "papered." The simplest way of putting up butterflies in papers is to take an oblong piece of any kind of moderately good paper and fold it as indicated in the diagram (see Plate E, Fig. *b*), first folding on the line a-b, then on a-d and c-b; then on the lines b-f and e-a, as marked in the diagram. The result is the enclosure of the insect as shown in Plate E, Fig. *c*. A hundred or more of such envelopes may be put into an ordinary cigar box. Such boxes, filled with butterflies, in order to prevent mould and the ravages of pests, should have some chloroform or carbon bisulphide put into them and afterward a spoonful or two of naphthaline crystals. Then they should be closed and sealed up by pasting strips of paper over the edges. Butterflies thus collected on journeys may be safely carried for long distances without injury, or even transmitted through the mails provided the boxes are strong enough to resist crushing. When on journeys the writer of these paragraphs always papers his specimens, bringing them home to be later carefully mounted at his leisure. It is of the utmost importance to note on each envelope the place and the date of capture, so that these may later be placed upon the little labels or tickets which are put upon the pins after the insects have been expanded and mounted for display.

MOUNTING BUTTERFLIES

The writer cannot do better in dealing with this subject than to transfer from "The Butterfly Book" the substance of the directions there given in relation to this matter.

When the collector has time enough at his disposal he should at once mount his specimens as they are intended to be displayed. The insect should first of all be pinned. For this purpose "insect pins" should be used. These are made either of soft steel or of pin metal. The first are to be preferred, except in very damp climates, where they sometimes rust if they have not been properly enamelled with shellac. The pin should be thrust perpendicularly through the thorax, midway between the wings, and at a considerable elevation upon the pin. It should then be placed upon the setting board or setting block. Setting boards or setting blocks are pieces of wood having a groove on the upper surface of sufficient depth to accommodate the body of the insect and to permit the wings to be brought to

EXPLANATION OF PLATE E

Fig. a. Vivarium, or cage in which to breed caterpillars.

a, base, kept even by cleats, *g*, *g;* on this is placed a pan 4 inches deep made of sheet zinc, and filled with earth; to the middle is soldered a tube of zinc, into which a large bottle fits; the bottle is filled with water to keep the plants placed in it fresh and green; *b*, outer case, with sides of glass, fitting closely about the zinc pan; *c*, top, covered with wire-cloth, rabbeted on *b*, and easily lifted off.

Fig. b. Diagram showing way to make paper envelopes for butterflies.

Fig. c. Envelope folded with butterfly inside.

Fig. d. Stretching board for expanding moths and butterflies. Strips of tracing muslin are used on this to keep the wings down, paper will also serve the purpose.

Fig. f. Stretching board, showing how wings may be held in place by pieces of thin cardboard.

Fig. e. Showing the way in which the antennæ and body may be held in place with insect pins while the insect is drying.

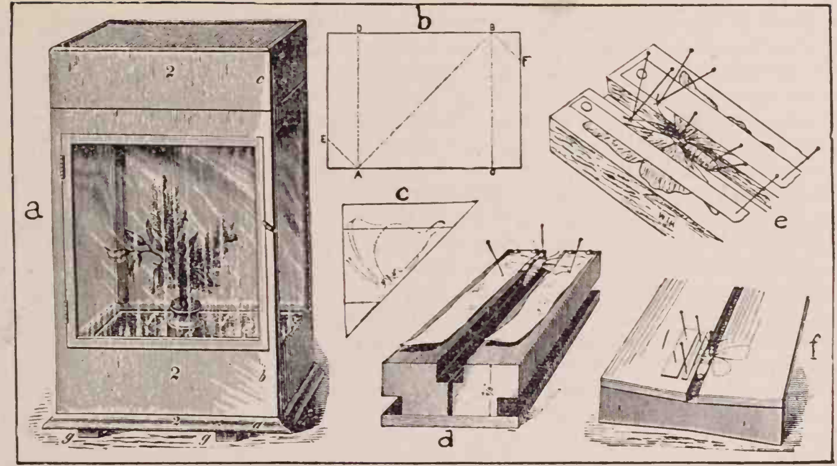


PLATE E

the level of the upper surface of the board (see Plate D, Figs. 6 and 7; and Plate E, Figs. *d*, *e*, *f*). They should also be provided either with a cleft or a hole which will permit the pin to be thrust down below the body of the insect for a considerable distance. As a rule the wings of all specimens should be mounted at a uniform elevation of about seven eighths of an inch above the point of the pin. This is known as the "continental method" of mounting, and is infinitely preferable to the old-fashioned "English method," in which the insect was pinned low down upon the pin, so that its wings touched the surface of the box.

Setting blocks are most advantageously employed in mounting small species, especially the Hesperiidæ, the wings of which are apt to be refractory. When the insect has been pinned upon the setting board or setting block, the next step is to set the wings in the position which they are to maintain when the specimen is thoroughly dry. This is accomplished by means of what are known as "setting needles." Setting needles may be easily made by simply sticking ordinary needles into wooden matches from which the tips have been removed; steel insect pins will serve as well. In drawing the wings into position, care should be taken to plant the setting needle or pin behind the strong nervure on the costal margin of the wing; otherwise the wings are liable to be torn and disfigured. The rule in setting lepidoptera is to draw the anterior wing forward in such a manner that the hind margin of this wing is at right angles to the axis of the body, the axis of the body being a line drawn through the head to the extremity of the abdomen. The hind wing should then be moved forward, its anterior margin lying under the opposing margin of the front wing. When the wings have thus been adjusted into the position which they are to occupy, slips of tracing-muslin or of paper should be drawn over them and securely pinned, the setting needles being removed.

In pinning down the strips which are to hold the wings in place, be careful to pin around the wing, but never if possible through it. When the wings have been adjusted in the position in which they are to remain, the antennæ should be attended to and drawn forward on the same plane as the wings, and secured in place. This may ordinarily be done by setting pins in such a position as to hold them where they are to stay. Then the body, if it has a tendency to sag down at the end of the abdomen, should be raised. This may also be accomplished by means of pins thrust beneath on either side. Plate E, Fig. *e*, shows clearly what is intended. When the insect has been set, the board should be put aside in a place where it will not be molested or attacked by pests, and the specimens upon it allowed to dry. A box with shelves in it is often used for this purpose. This box should have a door at the front covered with wire gauze, and the back should also be open, covered with gauze, so as to allow a free circulation of air. A few balls of naphthaline placed in it will tend to keep away mites and other pests. The time which the specimen should remain on the board varies with its size and the condition of the atmosphere.

Most butterflies and moths in dry weather will be sufficiently dried to permit of their removal from the setting boards in a week; but large, stout-bodied moths may require as much as two weeks, or even more time, before they are dry enough to be taken off the boards. The process of drying may be hastened by placing the boards in an oven, but the temperature of the oven must be quite low. If too much heat is applied great injury is sure to result. Only a careful and expert operator should resort to the use of the oven, a temperature above 120 F. being sure to work mischief.

When butterflies or moths have been put up in papers or mounted on pins without having their wings expanded and set, it becomes necessary before setting them to relax them. This may be accomplished in several ways. If the specimens have been pinned it is best to place them on pieces of sheet-cork on a tray of sand which has been thoroughly moistened and treated with a good dose of carbolic acid. Over all a bell glass is put. A tight tin box will serve the same purpose, but a broad sheet of bibulous paper should always be put over the box, under the lid before closing it, and in such a way as to leave the edges of the paper projecting around the edges of the lid. This is done to absorb the moisture which might settle by condensation upon the lid and drop upon the specimens. In a bell glass the moisture generally trickles down the sides. Earthenware crocks with closely fitting lids are even better than tin boxes, but they must have paper put over them before closing, in the same way as is done when tin boxes are used. When specimens have been preserved in papers or envelopes these should be opened a little and laid upon damp, carbolized sand under a bell glass or in a closed receptacle of some kind. Papered specimens may also be placed in their envelopes between clean towels, which have been moistened in water to which a little carbolic acid has been added. The towels should be wrung out quite dry before using them. Pieces of dampened blotting paper are even better than towels. The method of placing between towels should never be used in the case of very small and delicate species and those which are blue or green in color. Great care must be exercised not to allow the insects to become soaked or unduly wet. This ruins them. They should, however, be damp enough to allow the wings and other organs to be freely moved. When the insects have been relaxed they may be pinned and expanded on setting boards like freshly caught specimens. It is well in setting the wings of relaxed specimens, after having thrust the pin through the body, to take a small forceps and seizing the wings just where they join the body gently move them so as to open them and make their movement easy before pinning them upon the setting board. The skilful manipulator in this way quickly ascertains whether they have been sufficiently relaxed to admit of their being readily set. If discovered to be too stiff and liable to break they must be still further relaxed. Dried specimens which have been relaxed and then mounted generally require only a short time to dry again, and need rarely be kept more than twenty-four hours upon the setting boards.

The process of setting insects upon setting blocks is exactly the same as when setting boards are used, with the simple difference that instead of pinning strips of paper or tracing-muslin over the wings, the wings are held in place by threads or very narrow tapes, which are wound around the block (see Plate D, Figs 6 and 7). When the wings are not covered with a very deep and velvety covering of scales the threads or tapes may be used alone; but when the wings are thus clothed it becomes necessary to put bits of paper or cardboard over the wings before wrapping with the threads. Unless this is done the marks of the threads will be left upon the wings. Some little skill, which is easily acquired by practice, is necessary in order to employ setting blocks to advantage, but in the case of small species and species which have refractory wings they are much to be preferred to the boards.

The work of mounting small insects which have been relaxed must be done quite quickly and in a cool room or in a moist atmosphere. In a very dry and hot atmosphere the minuter things dry so quickly that difficulties are at once encountered.

One of the best ways in which to secure perfect specimens is to breed them from the caterpillar, or even from the egg. A stylish and very good cage for breeding is shown on Plate E, Fig. 2. As good a cage as this is not necessary, and the collector will succeed with one or more clean store-boxes covered with a lid consisting of a frame over which gauze or muslin has been stretched. The food-plant on which the caterpillar feeds is kept fresh in bottles or jars. It is important, after the plants have been put into the jar of water, to stuff around the stems cotton or soft paper, so that the caterpillars may not crawl down and, falling into the water, drown themselves. The bottom of the box may be filled to the depth of four or five inches with loam and covered with dead forest leaves. The loam should not be allowed to dry out thoroughly, but should be kept somewhat moist, *not wet*. A little sprinkling of water from time to time will suffice when done with care. The caterpillars feed upon the food-plant, and finally undergo transformation in the cage into the pupa, and eventually emerge as the butterfly or moth. The breeding of lepidoptera in this way is a fascinating occupation for those who have leisure to attend to it. For more minute instructions in reference to this matter the reader is referred to "The Butterfly Book." The caterpillars and chrysalids themselves may be preserved in little phials, in alcohol or in a solution of formaldehyde. The latter, however, is not to be recommended, because, although it preserves colors better than alcohol, and does not tend to shrivel up the bodies, it makes them stiff and difficult to handle and examine. The best way of preserving caterpillars is to inflate them. Directions for doing this are contained in "The Butterfly Book."

In order to preserve collections of lepidoptera in beautiful condition, light, moisture, and insect pests must be excluded. Light bleaches many species, especially those which are red, brown, or green in color. Moisture produces mold and mildew. Insect pests such as mites, *Anthrenus*, and *Dermestes*, the two latter being species of beetles, devour specimens. The receptacles containing collections should therefore be furnished with covers excluding the light, kept in a dry place, and be so tight that insect pests will not enter. However, as an additional precaution, it is well to place in every box or drawer moth balls or lumps of camphor, secured so that they cannot roll about. These tend to deter predaceous insects from entering the receptacles. If by any chance they have entered, neither the naphthaline nor the camphor in some cases will prevent their ravages. In the great collections which are under the care of the writer it is a rule from time to time to go over all the cases and put into every receptacle a small quantity of carbon bisulphide. The fumes of carbon bisulphide kill all grubs and matured insects which may have hidden themselves in the cases, and it is believed that it also tends to destroy the life in eggs which may have been laid in the boxes. Great care should be used, however, in employing carbon bisulphide, as the fumes mingled with the oxygen of the atmosphere form an explosive compound. The work should never be done where there is danger of ignition from an open fire or light. Boxes for the preservation of insect collections are made by many firms, and prices for such receptacles vary according to their size and the materials employed in their construction. All receptacles, however, should be lined at the bottom with cork or some other soft material into which the pins sustaining the insects can be put. We employ in the Carnegie Museum a composition cork covered with white paper, which is made in sheets of varying sizes, according to requirement, by the Armstrong Cork Manufacturing Company of Pittsburgh, Pa., the largest cork-manufacturing establishment in the world. This is the most satisfactory material which is made.

Large collections are advantageously preserved in cabinets, the drawers of which are covered with glass through which the insects may be inspected without handling them. Here again, for the details of the construction of boxes, trays, and cabinets, the reader is referred to "The Butterfly Book," which may be found in every public library, and is in the hands of multitudes of individuals.

In arranging specimens the scientific order should be followed. The species belonging to a given genus should be placed together. The little labels attached to the pins should give both the generic and the specific name, the locality where the specimen was taken, and the sex, if known. For the purpose of designating the sex naturalists employ what are known as "sex marks," the male being indicated by the sign of Mars, ♂, while the female is indicated by the sign of Venus, ♀.

The inscription *Papilio philenor*, ♂ , means that the specimen is a male, and the inscription *Papilio philenor*, ♀ , means that it is a female of the same species.

The classification of the genera and species should be subordinated further to the classification into families. There are five families of butterflies represented in the United States and Canada. They are the following:

1. The Nymphalidæ, or "Brush-footed Butterflies."
2. The Erycinidæ, or "Metal-marks."
3. The Lycænidæ, or "Blues," "Coppers," and "Hair-streaks."
4. The Papilionidæ, or the "Swallowtails" and their allies.
5. The Hesperiidæ, or the "Skippers."

In every well-arranged collection of butterflies certain drawers or boxes should be set apart for the reception of the insects belonging to these families, and they should be placed under their proper genera, according to their species. Nothing is more beautiful or interesting to those who have a love of nature than a collection of butterflies thus classified and displayed.

In recent years an ingenious friend of mine has devised a system of mounting butterflies under glass in cases made of a shell of plaster of paris, which he backs with cardboard and seals around the edges with gummed paper. Latterly he has taken to mounting them between pieces of glass which he secures in the same way.

Specimens thus preserved keep well, may be handled readily without fear of injury to them, and in the glass cases both sides of their wings may be examined. A collection of butterflies mounted in this way may be stored in shallow trays and placed in scientific order. The process of mounting in this fashion is, however, somewhat laborious and expensive, and is not generally adopted by scientific men, who wish to be free to examine their specimens under the magnifying glass, occasionally touching the wings with benzine to disclose the facts of neuration, and to minutely investigate the feet and other parts of the body, which, when sealed up in the way I have described, are not easily accessible.

Having thus briefly outlined the principal facts as to the nature of butterflies in general, and the best methods of collecting and preserving them, we now pass on to the description of the commoner species which are found on the continent of North America, north of Mexico and the Straits of Florida.

Class INSECTA (Insects)
Order LEPIDOPTERA (Scale-winged Insects)
Suborder RHOPALOCERA (Butterflies)
Family NYMPHALIDÆ (The Brush-footed Butterflies)

The Nymphalidæ may be distinguished from all other butterflies by the fact that *in both sexes the foremost, or prothoracic, pair of legs is greatly dwarfed, useless* *for walking, and therefore carried folded up against the breast.* This is the largest of all the families of butterflies and has been subdivided into many subfamilies. Some of the genera are composed of small species, but most of them are made up of large or medium-sized forms. To this family belong many of the most gorgeously colored butterflies of the tropics, among them the brilliant blue *Morphos* of equatorial America.

The caterpillars, when they emerge from the egg, have heads much greater in diameter than the rest of their bodies. In the earlier stages the bodies taper from before backward, and are adorned with little wart-like protuberances, which bear hairs. In later stages these little protuberances in many genera are replaced by branching spines and fleshy projections, which impart to the caterpillars a forbidding appearance. The mature caterpillar generally has a cylindrical body, but in the subfamilies, *Satyrinæ* and *Morphinæ*, the larvæ are thicker at the middle, tapering forward and backward.

The chrysalids, which are generally marked by metallic spots, always hang suspended by the tail, except in the case of a few arctic species, which are found under a frail covering composed of strands of silk woven about the roots of tufts of grass, under which the larva takes shelter at the time of pupation.

In the region with which this booklet deals all the butterflies belonging to the *Nymphalidæ* fall naturally into one or the other of the following subfamilies: (1) the

Euplœinæ, or Euplœids; (2) the *Ithomiinæ*, the Ithomiids; (3) the *Heliconiinæ*, the Heliconians; (4) the *Nymphalinæ*, the Nymphs; (5) the *Satyrinæ*, the Satyrs; (6) the *Libytheinæ*, the Snout-butterflies.

KEY TO THE SUBFAMILIES OF THE NYMPHALIDÆ OF TEMPERATE NORTH AMERICA

I. With the veins of the fore wings not greatly swollen at the base.
  A. Antennæ naked, not clothed with scales.
    (a) Fore wings less than twice as long as broad . . . *Euplœinæ.*
    (b) Fore wings twice as long as broad and often translucent, the abdomen extending far beyond the inner angle of the hind wings . . . . *Ithomiinæ.*
  B. Antennæ clothed with scales, at least above.
    (a) Fore wings at least twice as long as broad . . . . *Heliconiinæ.*
    (b) Fore wings less than twice as long as broad.
      1. Palpi not as long as the thorax . . . . . *Nymphalinæ*
      2. Palpi longer than the thorax. . . . . . *Libytheinæ*
II. With some of the veins of the fore wing greatly swollen at the base . . . . *Satyrinæ.*

Subfamily Euplœinæ (The Euplœids)

Large or medium-sized butterflies; fore wings somewhat produced at apex; hind wings rounded, never with tails; fore legs greatly atrophied in the males, somewhat less so in the females; hind wings of the males marked with one or more sexual brands which in the American species are located on or near the first median nervule; some of the oriental species are white, many are dark brown or black in color, shot with purple and violet; all of the American species are of some shade of reddish brown or fulvous, with the apex of the fore wings and the outer borders of both fore and hind wings margined widely with darker color, and the veins and nervules also darker, standing out in bold relief upon the lighter ground-color; the apex of the primary and the outer border of the secondary wings are more or less spotted with light color, often with white.

The adult caterpillars are cylindrical in form, adorned with long fleshy filaments, and with their bodies of some light shade of yellow or green banded with darker colors. The American species feeds upon the plants belonging to the family of the *Asclepiadaceæ*, or Milkweeds.

The chrysalis is smooth, pale in color, often ornamented with metallic spots, usually golden.

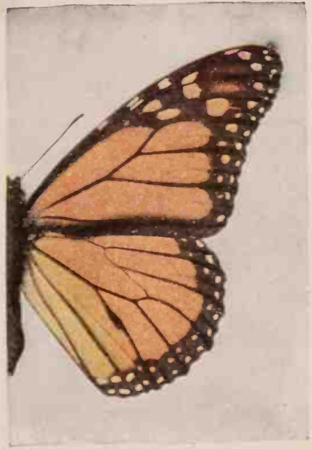
This subfamily, which is represented in the tropics of the Old World by many genera and species, is only represented in the United States by one genus, *Anosia*.

GENUS ANOSIA HÜBNER

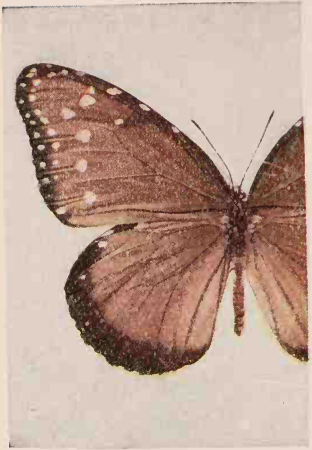
Butterfly, large or medium-sized; fore wings triangular, produced; hind wings rounded, the inner margins clasping the abdomen when at rest; apex, outer margins, and veins, dark; male with sex-mark on first median nervule of hind wing. *Egg* ovate conical, ribbed perpendicularly and horizontally. *Larva* cylindrical, with long, dark, fleshy filaments before and behind; body usually pale in color, ringed with dark bands. *Chrysalis* pendant, stout, cylindrical, abdomen rapidly tapering, and ending in long cremaster; pale, with metallic spots.

A large genus, many species being found in the tropics of both hemispheres, but only two in the United States. The insects are "protected," being distasteful to other animals, thus escaping attack.

(1) *Anosia plexippus* (Linnæus), The Monarch, Plate I, ♂; Plate C, Fig. g, *egg;* Figs. a–c, *larva pupating;* Fig. d, *chrysalis.* Upper side of wings reddish brown, apex, margins, and veins black, under side paler; a double row of whitish spots on outer borders, apex crossed by two bands of light spots. Expanse of wings 3.25 to 4.25 inches. *Egg* pale green. *Caterpillar*



PL. II



feeds on milkweeds, and is found in Pennsylvania from June onward. *Chrysalis* pale green spotted with gold.

Breeds continuously. As summer comes the butterflies move north, laying eggs. The insect spreads until it reaches its northern limit in the Dominion of Canada. In fall it returns. Swarms of the retreating butterflies gather on the northern shores of Lakes Erie and Ontario and in southern New Jersey. Recently the Monarch has become domiciled in many parts of the Old World.

(2) *Anosia berenice* (Cramer), The Queen, Plate II, ♀.

Smaller than the Monarch; the ground-color of the wings livid brown. The markings, as shown by the Plate, are somewhat different from those of the preceding species. Expanse 2.5 to 3 inches.

This butterfly does not occur in the North, but ranges through New Mexico, Texas, Arizona, and southward.

Subfamily ITHOMIINÆ (The Ithomiids)

Butterflies of moderate size, though a few species are quite large. Fore wings at least twice as long as wide; hind wings small and rounded, without tails. Abdomen produced beyond the margin of the hind wing. Wings more or less transparent. Antennæ long and very slender, with a slender club at end, naked. Fore legs greatly atrophied, especially in the males. *Larvæ* and *chrysalids* resembling those of the *Euplœinæ*, the chrysalids being short, cylindrical, and marked with metallic spots. The family, with the exception of the Australian genus, *Hamadryas*, is confined to the New World, in the tropics of which there are swarms of genera and species. Like the *Euplœinæ* they are "protected." But two genera are reported from our territory.

GENUS CERATINIA FABRICIUS

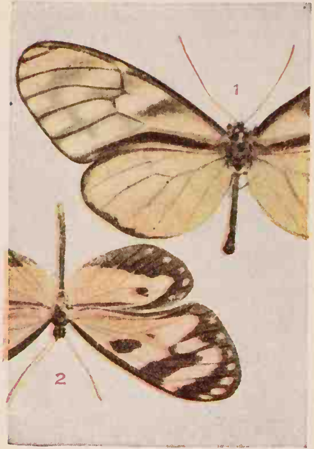
Distinguished from other allied genera by the strongly lobed costal margin of the hind wings in the male.

There are fifty species of this genus known from the American tropics, but only one occurs within the limits of the United States, and only in the extreme southwestern portion of our territory.

(1) *Ceratinia lycaste* (Fabricius), Plate III, Fig. 2, ♀ (Lycaste Butterfly)

This insect, which may easily be identified by the figure we give, is reported from southern California. The plate shows the variety, named *negreta*, which has a spot at the end of the cell of the hind wing instead of a black bar, as is the case in specimens from Panama. Expanse 2.1 to 2.25 inches. Wright does not include this species in his list of butterflies of the west coast.

PL. III



GENUS DIRCENNA DOUBLEDAY

Medium-sized *butterflies,* with quite transparent wings. Abdomen not as long as in the preceding genus. Hind wing of male strongly bowed forward at middle, the costal vein tending to coalesce with the subcostal. Only one species occurs in our region. There are many species in the American tropics.

(1) *Dircenna klugi* (Hübner), Plate III, Fig. 1, ♂ (Klug's Dircenna).

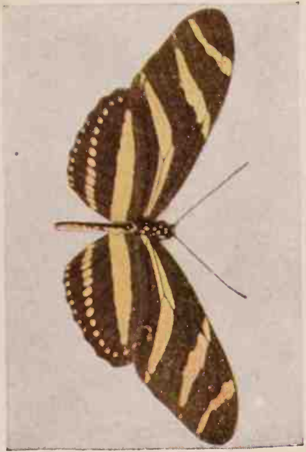
The wings are pale brown, narrowly margined with darker brown; the fore wings have a pale yellowish diagonal bar at the end of the cell, followed by two bands of similar spots, curving from the costa to the inner margin. Expanse 2.5 to 2 75 inches.

Habitat: Southern California and Mexico according to Reakirt. The citation of California by this authority may refer to Lower California. In recent years no specimens have been taken in Upper California. It may be that with the changes which have taken place in the development of the country the insect has become extinct about Los Angeles and San Diego, where Reakirt collected.

SUBFAMILY HELICONIINÆ (THE HELICONIANS)

Moderately large *butterflies*. Fore wings twice as long as wide. Antennæ nearly as long as the body; club tapering, but stouter than in the *Ithomiids*, clothed with scales above. Fore legs feeble in both sexes. Color black, sometimes shot with blue, and variously marked with white, yellow, orange, or crimson spots. *Eggs* cylindrical, twice as high as wide, tapering and truncate above, ribbed. *Caterpillar*, when mature, with six branching spines on each segment. *Chrysalis* angulated, covered with curious projections, making it look like a shrivelled leaf, dark in color.

These insects, which are strongly "protected," abound in the forests of tropical America. There are many species, but only one occurs in our region.



GENUS HELICONIUS LATREILLE

(1) *Heliconius charithonius* (Linnæus). Plate IV, ♀ (The Zebra).

The figure suffices for identification. The caterpillar feeds upon the foliage of different species of Passion-flower. Common in the hot parts of the Gulf States, thence ranging all over the American tropics. Expanse 2.5 to 3.5 inches.

SUBFAMILY NYMPHALINÆ (THE NYMPHS)

The *butterflies* belonging to this subfamily are usually medium-sized or large, although some are very small. Antennæ usually as long as, or longer than, the abdomen, more or less heavily clothed with scales. Palpi stout, densely clothed with hairs and scales. Thorax stout or very robust. Fore wings relatively broad, except in certain forms which mimic the *Heliconiinæ*, produced at apex, more or less excavated on outer margin; discoidal cell generally less than half the length of wing, and in most genera closed; costal vein terminating behind the middle of the front margin of the wing; the two inner subcostal nervules given off before, the outer subcostals beyond, the end of the cell. Hind wings rounded, or angulated, with the outer border either rounded, scalloped, or tailed, the inner border always forming a channel for the reception of the abdomen; discoidal cell often open, or closed by an almost imperceptible veinlet. *Eggs* conoid, barrel-shaped, or globular, variously ornamented. *Larva* when hatched with minute wart-like eminences, each bearing a hair, the hairs in later stages being replaced in many forms by branching spines. *Chrysalis* suspended, variously ornamented, often having on the dorsal surface raised eminences, and the head bifurcate.

There are about thirty genera, containing somewhat less than two hundred species, which belong to this subfamily in the United States.

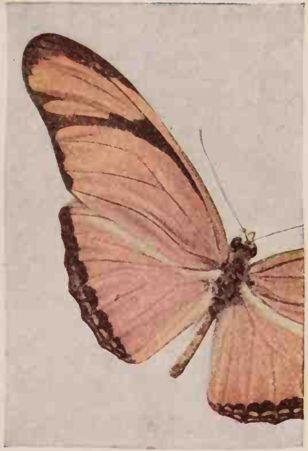
GENUS COLÆNIS DOUBLEDAY

The *butterflies* of this genus mimic the Heliconians in form; their fore wings are long and narrow. The cell in the hind wing is open. There are a number of species, two of which are found in the hot parts of the Gulf States. The larvæ resemble those of the genera, *Dione* and *Euptoieta*, and, like them, feed on the Passifloraceæ.

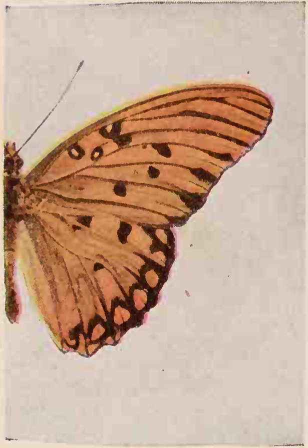
(1) *Colænis julia* (Fabricius) (Julia). Plate V, ♂.
The figure on the plate obviates the necessity for a description. The insect occurs sparingly in Florida and in Texas, especially about Brownsville. It is very common in Mexico, and thence southward. Expanse 3 to 3.5 inches.

(2) *Colænis delila* (Fabricius), Delila.
Imagine all the dark markings shown in the figure of *Colænis*

PL. V



PL. VI



julia on Plate V effaced, and replaced by the lighter ground-color, only all of the wing a shade paler and yellower, and the fore wings a trifle more pointed at the tip, and you have a mental picture of this species, which has the same range as the one shown. Expanse 2.75 to 3.3 inches.

GENUS DIONE HÜBNER

This genus has the fore wings elongated, but less so than in *Colænis.* The cell in the hind wing is open. The palpi are much more robust and heavily clothed with hairs than in *Colænis,* thus resembling those of the genus *Argynnis.* Like *Argynnis* the under side of the wings of all species of *Dione* is spotted with silver.

There are a half dozen species of *Dione* in the New World, all but one of which occur outside of our limits. They are gloriously beautiful insects.

(1) *Dione vanillæ* (Linnæus) (The Gulf Fritillary). Plate VI, ♂.

This lovely insect ranges from southern Virginia southward and westward to southern California, and thence further south, wherever the sun shines and Passion-flowers bloom. The figure on the plate does not show the magnificent markings of the under side of the wings, but catch one, and you will see that you have a beauty in your possession. Expanse 2.75 to 3.25 inches.

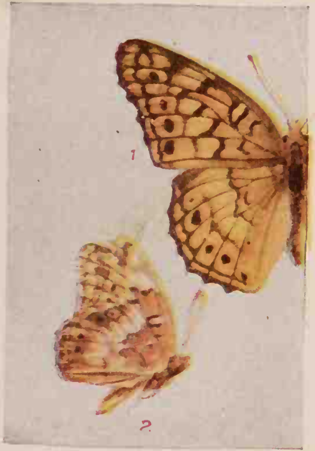
GENUS EUPTOIETA DOUBLEDAY

There are two species of this genus found in the United States. The *butterfly* has the cell of the fore wing closed by a feeble veinlet and the cell of the hind wing open. The antennæ and palpi resemble those of the genus *Argynnis*. The under sides of the wings are not spotted with silvery marks.

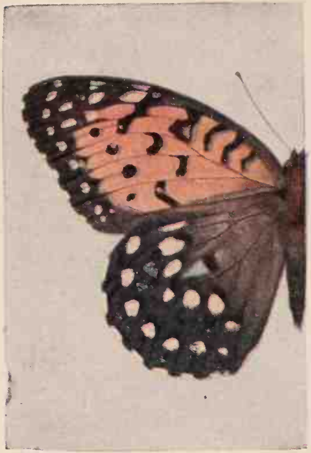
(1) *Euptoieta claudia* (Cramer), The Variegated Fritillary. Plate VII, Fig. 1, ♂; Fig. 2, *under side.*

The caterpillar feeds upon the leaves of Passion-flowers and violets. It is reddish yellow in color, with black spines on the segments, white spots on the back, and dark brown bands running the long way on the sides. The *chrysalis* is pearly white mottled with black spots and streaks. The insect

PL. VII



PL. VIII



ranges from southern New England south and west, and is reported from as far north as Alberta. It goes as far as Argentina in the south. Expanse ♂, 1.75 to 2.25 inches; ♀, 2.25 to 2.75 inches.

(2) *Euptoieta hegesia* (Cramer), The Mexican Fritillary. Very much like the preceding species, only the wings, especially the hind wings, have very few dark markings, except about the borders, and the insect is smaller. Expanse ♂, 1.6 to 2.25; ♀, 2.25 to 2.5 inches.

Found in Texas, Arizona, and southward.

Genus ARGYNNIS Fabricius

Butterflies of medium or large size, generally of some shade of reddish-fulvous, conspicuously marked on the upper side with dark spots and waved lines, which are less conspicuously repeated on the under side, and in many species in part replaced by silvery spots. In some species the males and the females are *dimorphic*, that is, very different in appearance from each other. The palpi are strongly developed and clothed heavily with hairs. The antennæ have a short, well-defined, flattened, somewhat spoon-shaped club. The cells of both fore and hind wings are closed. *Eggs* cone-shaped, flattened, and depressed at the top, rounded at the base, ribbed both ways, mostly near the base. *Caterpillars* dark in color, spiny, with the spines on the first segment the longest; feeding on violets at night, and hiding during the day. *Chrysalis* angular, adorned with more or less prominent projections, head bifid.

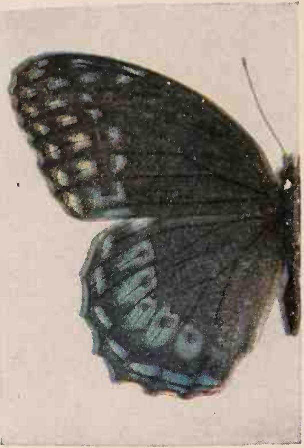
This large genus has many species. It occurs in both hemispheres. Its metropolis is North America, and we can speak of only a few of the commoner and more conspicuous forms.

(1) *Argynnis idalia* (Drury), The Regal Fritillary. Plate VIII, ♂.

The figure given will help the student to recognize this insect. The caterpillar, when fully grown, is about 1.75 inches in length, black, banded and striped with ochreous and orange-red, and ornamented with fleshy spines, of which the two rows on the back are white tipped with black, those on the sides black tinged with orange where they spring from the body. The chrysalis is brown mottled with yellow.

PL. IX

PL. X



Ranges from Maine to Nebraska, and southward among the Appalachian highlands into West Virginia. Expanse 2.75 to 4 inches.

(2) *Argynnis diana* (Cramer), Plate IX, ♂; Plate X, ♀ (Diana).

This lovely insect is dimorphic, the male having the outer borders of the wings orange-fulvous, while the female has the wings bordered with blue spots. Expanse 3.75 to 4.5 inches.

It belongs to the southern Appalachian region, and ranges from West Virginia and the Carolinas to northern Georgia, thence westward to the Ozarks, being found sparingly in southern Ohio and Indiana, and commonly in parts of Kentucky.

(3) *Argynnis leto* Edwards, Plate XI, ♀ (Leto).

The male of this species is in some respects not unlike the two following species, but with the wings darker at their bases: the female, on the other hand, is quite different, the dark spots on the inner half of the wings running together and giving this part of the wings a dark brown or black appearance, while the outer borders are pale yellow. Expanse 2.5 to 3.25 inches

This beautiful form occurs on the western side of the Rocky Mountains, in California and Oregon.

(4) *Argynnis cybele* (Fabricius), Plate XII, ♀, *under side* (The Great Spangled Fritillary).

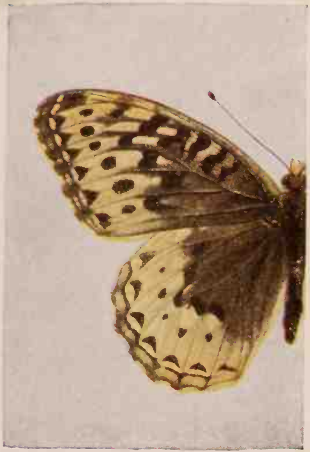
The male is bright reddish-fulvous on the upper side of the wings, with the characteristic dark markings of the genus; on the under side the wings are heavily silvered. There always is a pale yellowish submarginal band shown on the under side of the hind wings which does not appear in the next species, and by the presence or absence of which they may be discriminated from each other. The caterpillars hibernate as soon as hatched, and pass the winter in this state, feeding up and maturing in the following spring when the violets begin to grow. Expanse 3 to 4 inches.

This species ranges from Maine to Nebraska and southward to Georgia and Arkansas. It is our commonest species in the Middle States.

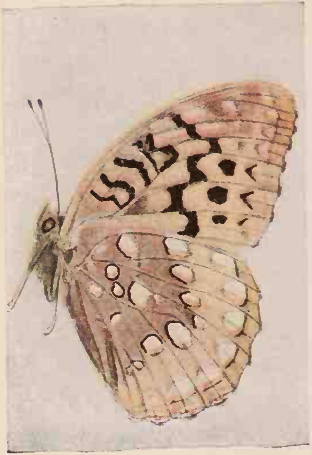
(5) *Argynnis aphrodite* (Fabricius). Plate XIII, ♀, *under side* (Aphrodite).

Closely resembling the preceding species, but smaller. The

PL. X



PL. XII



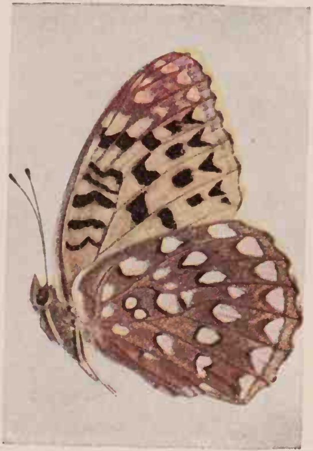
under side of the hind wings has the submarginal band narrower than in *A. cybele* and often wholly wanting, as shown in the figure. The fore wings on the under side are redder at the base than in *A. cybele.* Expanse 3 to 3.5 inches.

The range is the same as that of the preceding species.

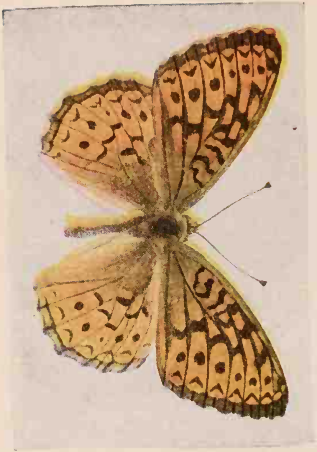
The two species *A. cybele* and *A. aphrodite* usually are found flying at the same time and in the same places, and when on the wing it is often very difficult to distinguish them from each other. In fact they seem to intergrade into each other, and in a long series of specimens such close resemblances often occur that it is puzzling to decide which is which. The deeper red of the fore wing of *A. cybele* is the best diacritical character. The paler outer margin of the hind wing of *A. aphrodite,* which is typically shown in Plate XII, sometimes occurs also in *A. cybele,* and I have specimens of the latter which very closely approximate the former in this regard. In selecting specimens for illustration I have chosen the two extreme forms in which the pale wing of *A. aphrodite* is seen to contrast on the under side with the darker wing of *A. cybele* shown on Plate XIII.

It may be remarked in passing that the genus *Argynnis* is very difficult, and the writer has been in the habit of comparing it to the genus *Salix*, the willows, among flowers. Botanists know how the willows seem to run together, and how hard it is to discriminate the species. The same thing is true of this great genus of butterflies with which we are now dealing. It is particularly true of the species which occur in the region of the Rocky Mountains, of which the writer has probably the largest collection in existence, including all of the types of the late William H. Edwards. The test of breeding has not been fully applied as yet to all of these forms, and it is doubtful whether some of them are more than varieties or local races. There is here a field of inquiry which should tempt some young, ardent, and careful student. The day for more thorough work is at hand, and I hope some reader of these pages may be converted to the task. Entomological study should become more intensive, as well as extensive. The fathers of the science have paved the way and laid foundations; it remains for the rising generation to complete the work which the fathers have begun.

PL. XIII



PL. XIV



(6) *Argynnis atlantis* Edwards. Plate XIV, ♂ (The Mountain Silverspot).

Smaller than *A. aphrodite*, with narrower wings, darker at the base on both the upper and lower sides. The submarginal band below is pale yellow, narrow, distinct, and always present. Expanse 2.25 to 2.5 inches.

Ranges from Quebec to Alberta and southward, but is confined to the Appalachian mountain ranges in southern Pennsylvania and West Virginia.

The specimen figured on the Plate is the type of the male contained in the collection of the late William H. Edwards. Although taken long ago, it retains all its original freshness and beauty.

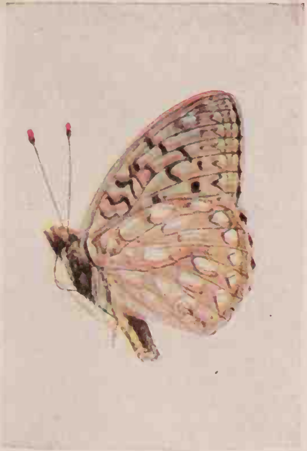
There used to be near Cresson on the summit of the Allegheny Mountains a field surrounded by woodland in which violets grew. When the clover was in bloom myriads of Fritillaries, belonging to the species *aphrodite*, *cybele*, and *atlantis*, congregated there. What captures we made! Many a collection on both sides of the Atlantic contains specimens taken in that field, but no possessor of these specimens can have the happy memories of the days passed in that field by their captor.

(7) *Argynnis callippe* Boisduval. Plate XV, ♀, *under side* (Callippe).

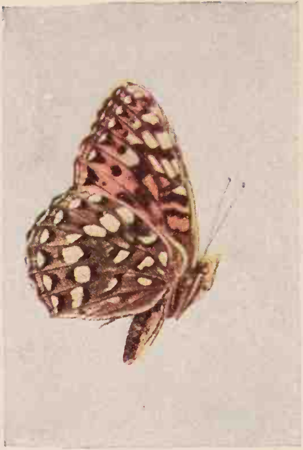
Wings on the upper side obscured with dark brown on which the pale buff spots, margined with black, stand out conspicuously. On the under side the wings are pale buff, with a greenish cast, the spots well silvered. Expanse 2.3 to 3 inches.

Abundant in southern California, according to W. G. Wright, preferring plains, and being confined mainly to the little hot valleys which traverse them. According to the same author the life of the insect as an imago is very brief, "the shortest of any Argynnid that I know of, being only a few days in length."

Many of the western species do not have the spots on the under side silvered, but are none the less beautiful for that. One of these species, without silvery spots, the spots being creamy white, without metallic lustre, is the beautiful insect figured on Plate XVI, *A. rhodope*, the under side of the female type of which we show. There are nearly a dozen species of *Argynnis* belonging to the same group with *A. rhodope*, but the latter is the most beautiful of all of them.



PL. XVI



(8) *Argynnis rhodope* Edwards. Plate XVI, ♀ *under side* (Type) (Rhodope).

The wings of the two sexes are quite alike on the under side. On the upper side, which we do not figure, the wings are bright fulvous, dark at the base, marked with heavy, black, confluent spots. Expanse 2.2 to 2.4 inches.

Found in Washington and British Columbia.

Genus BRENTHIS Hubner

(The Little Fritillaries).

Small or medium-sized *butterflies*, closely resembling those of the genus *Argynnis*. The chief difference is that in *Brenthis* only the first subcostal nervule branches off before the end of the cell, while in *Argynnis* the first and second are thus given off; palpi not so stout as in *Argynnis;* the basal spur of the median vein of the fore wing, found in *Argynnis*, is wanting in *Brenthis*. *Eggs* subconical, twice as wide as high, truncated, vertically ribbed. *Caterpillars* like those of *Argynnis*, but smaller, and often lighter in color, feeding on violets. *Chrysalis* pendant, about 0.6 inch long; two rows of conical tubercles on back.

Sixteen species are found in North America, all of which but two are subarctic or occur on high mountains.

(1) *Brenthis myrina* (Cramer), Plate XVII, Fig. 1, ♂, *upper side;* Fig. 2, ♂, *under side* (The Silver-bordered Fritillary).

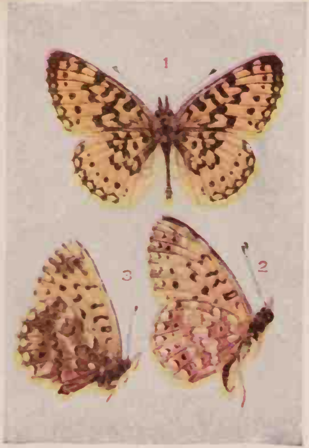
Well depicted in the figures we give. Expanse 1.40–1.70 inch. *Eggs* pale greenish yellow. *Caterpillar*, when fully grown, about 0.87 inch long, dark olive-brown, marked with lighter green, and covered with spiny, fleshy tubercles. *Chrysalis* yellowish brown marked with darker brown spots, some having a pearly lustre.

Ranges from Nova Scotia to Alaska and southward as far as the mountains of the Carolinas.

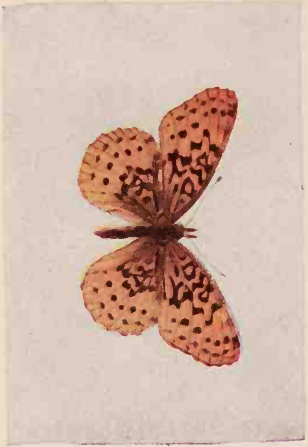
(2) *Brenthis montinus* Scudder, Plate XVII, Fig. 3, ♀, *under side* (The White Mountain Fritillary).

Upper side fulvous, the wings at base darker than in *B. myrina*, the black markings heavier. Hind wings below much darker than in *B. myrina*, the silvery spots being quite differ-

PL. XVII



PL. XVIII



ently arranged, the most conspicuous being a bar at the end and a round spot at the base of the cell of the hind wing. Expanse, ♂, 1.50 inch; ♀, 1.75 inch.

A small species living on the summit of Mt. Washington, New Hampshire, where a little colony has survived the glacial epoch, when the northeastern parts of the United States were covered with glaciers, as Greenland is to-day.

(3) *Brenthis bellona* (Fabricius), Plate XVIII, ♂ (The Meadow Fritillary).

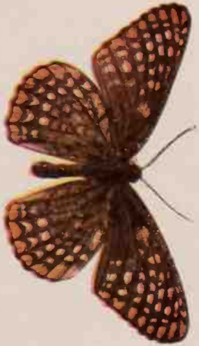
The only species of the genus, except *B. myrina*, found in the densely settled portions of the continent. Easily distinguished from *myrina* by the absence on the under side of the wings of the silvery spots, which make the Silver-bordered Fritillary so attractive. It is generally found upon the wing in the late summer and the fall of the year. In Pennsylvania it may be found when the asters are in bloom.

Common throughout Canada and the northern United States as far west as the Rocky Mountains and as far south as the Carolinas. Expanse 1.65–1.80 inch.

GENUS MELITÆA (THE CHECKER-SPOTS)

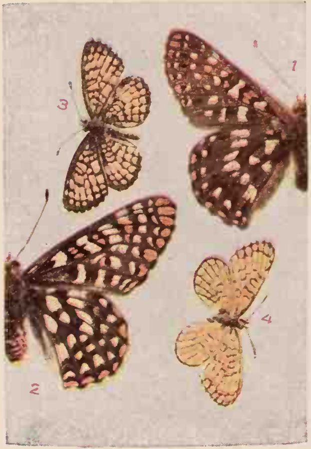
Generally small or medium-sized *butterflies.* Palpi not swollen; the third joint finely pointed; clothed with long hairs. Antennæ about half as long as the costal margin of fore wing, ending with a short, heavy, spoon-shaped knob. The cell in the fore wing is closed, in the hind wing open. The spots and markings are differently arranged from those in *Argynnis* and *Brenthis;* the wings are never silvered on the under side. *Eggs* subconical, flattened on top, fluted on the sides. *Caterpillars* gregarious when young, then separating; cylindrical, covered with short spines set with diverging hairs; feeding upon the *Scrophulariaceæ*, *Castileja*, and allied plants. *Chrysalis* rounded at the head, with sharply pointed tubercles on back, white or pale gray, adorned with dark markings and orange spots on back.

There are many species in the north temperate zone. Most of the more than thirty species in North America are confined to the western part of the continent, only two being found east of the Mississippi.



(1) *Melitæa phaëton* (Drury), Plate XIX, ♂ (The Baltimore).

PL. XX



Easily recognized by the figure. One of the larger species, the male having a width of 1.75–2.00, the female of 2.00–2.60 inches. Eggs brownish yellow when laid, changing to crimson, and later to black; deposited in clusters on balmony (*Chelone glabra*). Hatching in early fall, the little caterpillars spin a web or tent of silk, where they pass the winter. When spring comes, they scatter, fall to feeding, and after the fifth moult turn into chrysalids, from which the butterflies soon emerge.

Found locally in colonies in swampy places, where balmony grows, from Quebec to west of Lake Superior and south to the Carolina mountains.

(2) *Melitæa chalcedon* Doubleday and Hewitson, Plate XX, Fig. 1, ♂ (Chalcedon).

A common species in northern California, ranging eastward as far as Colorado and Wyoming. One of the larger species, expanding 1.75–2.5 inches. The caterpillar feeds on *Mimulus* and *Castileja*. The butterfly is variable, the females in particular differing in the size of the light spots on their wings.

(3) *Melitæa macglashani* Rivers, Plate XX, Fig. 2, ♀ (Macglashan's Checker-spot).

One of the largest species in the genus, exceeding in size the two foregoing, having a width of from 1.85–3.00 inches; closely resembling *M. chalcedon,* but the outer marginal red spots always bigger and the yellow spots paler and larger than in that species. Occurs in Utah, Nevada, and California.

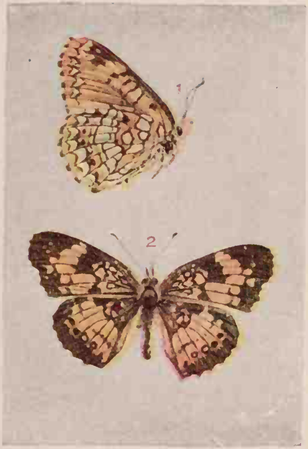
(4) *Melitæa harrisi* Scudder, Plate XXI, Fig. 1, ♀, *under side* (Harris' Checker-spot).

Fulvous on upper side; base of wings and outer margins black, black margins widest at apex. Five fulvous spots in cell of fore wing, two below it; two white spots on apex. Under side of wings well shown in the figure we give. Expanse 1.5–1.75 inch. *Eggs* lemon-yellow, conoid, flattened at top, ribbed. Adult *caterpillar* reddish, with a black stripe on middle of back, nine rows of black, branching spines on body. On each segment a black band in front of the spines, and two black bands behind them. Food-plants *Aster* and *Diplopappus. Chrysalis* pale gray or white, blotched with dark brown.

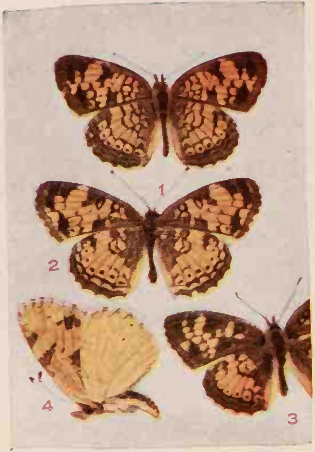
Ranges from Nova Scotia to Lake Superior.

(5) *Melitæa perse* Edwards, Plate XX, Fig. 3, ♂. *Type.* (The Arizona Checker-spot).

PL. XXI



PL. XXII



One of the very small species of the genus. The specimen we figure is the *type*, that is to say, the specimen upon which Edwards founded his description of the species. Expanse ♂, 1.00 inch; ♀, 1.10 inch.

Habitat Arizona and northern Mexico.

(6) *Melitœa dymas* Edwards, Plate XX, Fig. 4, ♀. *Type* (The Least Checker-spot).

Even smaller than the preceding, having an expanse of only 0.85 to 1.00 inch. It is much paler on the upper side than *M. perse*, and the markings are different.

Ranges from southwestern Texas and Arizona to Mexico.

Genus PHYCIODES Doubleday

(The Crescent-spots).

Usually quite small *butterflies*, the species found in our region being some shade of fulvous or reddish, above with dark markings, which are less distinctly reproduced on the paler under side of the wings. Of the spots on the under side the most characteristic is the crescent between the ends of the second and third median nervules. This, when present, is pearly white or silvery in color. Structurally these insects differ most markedly from the preceding genus in the enlarged second and the fine very sharp third joint of the palpi. *Eggs* higher than wide, slightly ribbed on top, pitted below, giving them a thimble-like appearance. *Caterpillars* cylindrical, with rows of short tubercles, much shorter than the spines in *Melitæa*, dark in color, marked with paler longitudinal stripes. *Chrysalis* with head slightly bifid, generally pale in color, blotched with brown.

Numerous species occur in Central and South America, but only about a dozen in the United States and Canada, most of them in the Southwestern States.

(1) *Phyciodes nycteis* Doubleday and Hewitson, Plate XXI, Fig. 2, ♂ (Nycteis).

Easily mistaken on the wing for *Melitæa harrisi*, which it closely resembles on the upper side, and with which it is often found flying, but an examination of the under side at once reveals the difference. The redder fore wings, paler hind wings, and the crescent on the lower outer border of these are marks which cannot be mistaken. Expanse ♂, 1.25–1.65 inch; ♀, 1.65–2.00 inches.

Ranges from Maine to the Carolinas and westward to the Rocky Mountains.

(2) *Phyciodes tharos* (Drury), Plate XXII, Fig. 1, ♂. Variety *marcia* Edwards, Plate XXII, Fig. 2, ♂ (The Pearl Crescent).

A very common little *butterfly*, which everybody must have noticed in late spring or early summer flitting about lawns and gardens, and in fall abounding upon clumps of asters. It may easily be recognized from the figures given. Expanse from 1.25–1.65 inch. The variety *marcia* comes from larvæ which have hibernated during the winter, and is lighter and brighter in color, especially beneath, than butterflies of the later summer and fall broods.

Eggs laid on asters and related plants; greenish yellow. Matured *caterpillar* dark brown, dotted on the back with yellow; adorned with short, bristly, black spines, yellow at base. *Chrysalis* pale gray, blotched with spots of brown.

Ranges from southern Labrador to Florida and westward to the Pacific Coast.

(3) *Phyciodes batesi* (Reakirt), Plate XXII, Fig. 3, ♂, *upper side;* Fig. 4, *under side,* ♀ (Bates' Crescent-spot).

Above closely resembling *P. tharos,* but with the dark markings much heavier; below hind wings quite uniformly pale yellowish fulvous, with a row of very pale marginal crescents; ends of veins tipped with brown. Expanse 1.25–1.65 inch.

Ranges from New England to Virginia and westward to the Mississippi.

(4) *Phyciodes pratensis* (Behr), Plate XXIII, Fig. 1, ♂ (The Meadow Crescent).

Closely resembling the preceding, but fore wings not as curved on the costal margin, and relatively longer and narrower; the pale markings more whitish, not so red, and more clearly defined. On the under side, especially in the female, the markings are heavier than in *P. batesi.* Expanse 1.15–1.40 inch.

Ranges from Oregon to southern California, Arizona, and northern Mexico.

(5) *Phyciodes camillus* Edwards, Plate XXIII, Fig. 2, ♂, *under side* (The Camillus Crescent).

Resembling *P. pratensis,* but the pale spots on fore wings paler, and on hind wings brighter fulvous. Below the dark markings not nearly so pronounced as in *P. pratensis*. Expanse 1.3–1.6 inch.

Ranges from British Columbia to Colorado and Kansas and south into Texas.

(6) *Phyciodes picta* Edwards, Plate XXIII, Fig. 3, ♀, *under side* (The Painted Crescent).

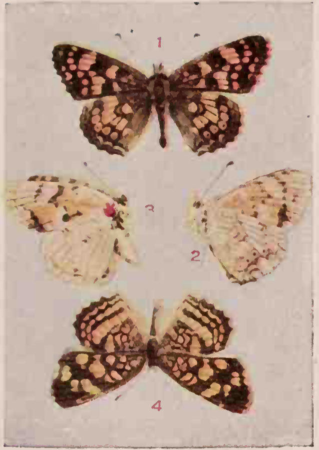
Below fore wings red on median area, with base, costa, apex, and outer margin pale yellow. The dark spots on this wing stand out prominently. Hind wings nearly uniformly bright yellow. Expanse 0.8–1.25 inch.

Ranges from Nebraska as far as Mexico. The larvæ feed on asters.

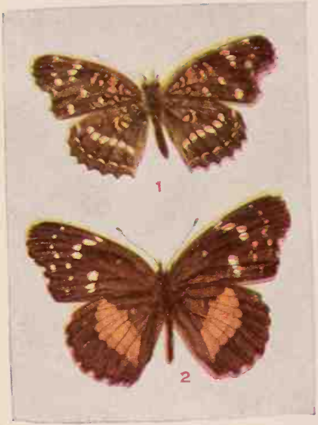
GENUS ERESIA DOUBLEDAY

Closely allied to *Phyciodes*, but distinguished from it by having the fore wing more or less deeply excavated on the outer margin about its middle, and the light spots on the hind wings arranged in regular bands. There are also differences in the form of the chrysalids and caterpillars. The genus is best represented in Central and South America, where there are many very beautiful species. Only three occur in our region. We have figured two of these.

PL. XXIII



PL. XXIV



(1) *Eresia frisia* (Poey), Plate XXIII, Fig. 4, ♂ (Poey's Crescent).

Our figure of the upper side will enable any one to recognize it. Below the wings are fulvous, mottled with dark brown and white, and the spots of the upper side reappear as white bands and markings. Expanse 1.4–1.5 inch.

Occurs in the extreme south of Florida about Key West, and is not uncommon in the Antilles, Mexico, and Central America.

(2) *Eresia texana* (Edwards), Plate XXIV, Fig. 1, ♀ (The Texan Crescent).

Well represented in our illustration. Below the fore wings are fulvous at base, and broadly marked with dark brown beyond the middle. Hind wings at base marbled wood-brown, and dark externally like the fore wings. The light spots of upper side reappear on lower side, but not so distinctly. Expanse 1.25–1.75 inch.

Ranges through Texas into Mexico, and South America. The genus *Eresia* is undoubtedly one of those which originated in the warm neotropical regions and which since the glacial epoch have spread northward. Many of our genera have come to us from the South.

Genus SYNCHLOE Boisduval (The Patch-spots)

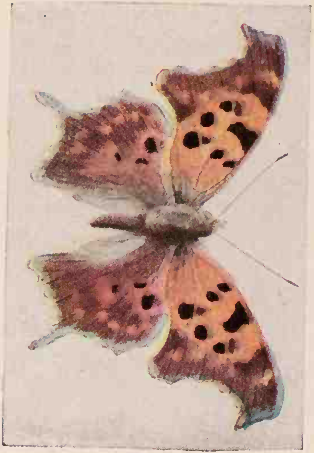
Medium-sized or small *butterflies*, often very gayly colored. Wings generally more produced than in the two foregoing genera, more excavated on outer margin of primaries, and third joint of palpus spindle-shaped, not sharp like the point of a needle, as in *Phyciodes* and *Eresia*. The lower discocellular vein in the fore wing is straight and not angled, as in the two last-named genera. *Eggs*, which are laid in clusters upon sunflowers (*Helianthus*), like those of *Phyciodes* in general appearance; the *caterpillars* and *chrysalids* like those of *Melitæa*. There are many species of the group found in the American tropics, and among them are many curious mimetic insects, which resemble minature Heliconians and Ithomiids. Three species occur in our southland, one of which we figure.

(1) *Synchloë janais* (Drury), Plate XXIV, Fig. 2, ♂ (The Crimson-patch).

The upper side of a small male specimen is well shown in our figure. Below the markings of the upper side are reproduced in the fore wings. Hind wings on this side black at base and on outer third. The basal area crossed by a yellow bar, on middle of wing a broad yellow band, washed externally with crimson, in which are numerous black spots. There is a marginal row of yellow, and a limbal row of white spots parallel to the outer border Expanse 2.50–3.00 inches.

Ranges through southern Texas, Mexico, and Central America.

PL. XXV



Genus GRAPTA Kirby (The Angle-wings)

Medium-sized or small *butterflies;* fore wing strongly acuminate at end of upper radial, deeply excavated on outer and inner border; hind wing tailed at end of third median nervule; cells on both wings closed; palpi heavily scaled beneath. Upper side of wings tawny, spotted with darker, under side mimicking the color of bark and dead leaves, often with a silvery spot about middle of hind wing. The butterflies hibernate in winter. *Eggs* taller than broad, tapering toward top, which is flat, adorned with a few longitudinal ribs, increasing in height upward, laid in clusters, or strung together, then looking like beads. *Larva* with squarish head; body cylindrical, adorned with branching spines. *Chrysalids* with head bifid; prominent tubercle on back of thorax; two rows of dorsal tubercles on abdomen; compressed laterally in thoracic region; color wood-brown or greenish. The caterpillars feed upon plants of the nettle tribe, including the elm and hops, though willows, azalea, and wild currants are affected by different species.

The genus is confined to the northern temperate zone. We have about a dozen species in America, of which five have been selected for illustration.

(1) *Grapta interrogationis* (Fabricius), form *fabricii* Edwards, Plate XXV. ♂ (The Question-sign).

The largest species of the genus in our fauna. Dimorphic, the upper sides of the hind wings in the form *fabricii* being fulvous with dark markings, those of the form *umbrosa* Lintner being uniformly dark, except at base. In the Middle States double-brooded. The second brood hibernates in the winged form. Expanse 2.50 inches.

Found throughout Canada and the United States, except on the Pacific Coast.

(2) *Grapta comma* (Harris), form *dryas* Edwards, Plate XXVI, ♂ (The Comma Butterfly).

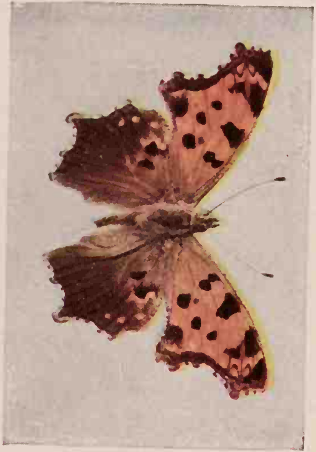
Larvæ feed on nettles; some are almost snow-white. The species is dimorphic. In the form *dryas* Edwards the hind wings are dark above, in the form *harrisi* Edwards they are lighter in color. Expanse 1.75–2.00 inches.

The range is much the same as that of the Question-mark.

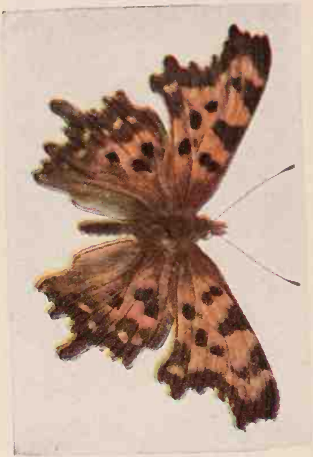
(3) *Grapta faunus* Edwards, Plate XXVII, ♀ (The Faun).

Readily recognized by the deep indentations of the hind wings, the heavy black border, and the dark tints of the under

PL. XXVI



PL. XXVII



side mottled conspicuously with paler shades. Expanse 2.00–2.15 inches. The larva feeds on willows.

Ranges from New England and Ontario to the Carolinas, thence westward to the Pacific.

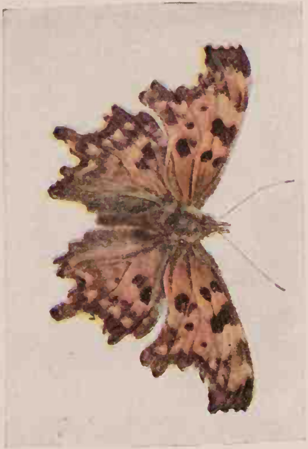
As I have remarked of the genus *Argynnis* that it is difficult, so also I may say of the genus *Grapta* that it provokes much discussion among those who have not had the opportunity to study full series of specimens of the various species. The resemblances are very great, and the differences are not accentuated, so that the superficial observer is easily led astray. The differences are, however, valid, even on the upper side of the specimens, which are more nearly alike than the lower side. Take the two species here presented to view on opposite pages. They resemble each other closely, but the student will soon see that there are differences, and these are constant. On the under side they are very great, *G. faunus* being light in color below, while *G. silenus* is very dark. In both species at the end of the cell of the hind wing there is on the under side a silvery spot which has the form of an inverted L (⅃), or is rudely comma-shaped.

(4) *Grapta silenus* Edwards, Plate XXVIII, ♂. *Type* (The Toper).

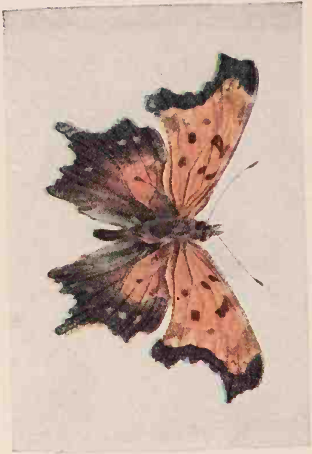
Wings in form very much like those of *G. faunus*, but the fore wing not as strongly produced at the ends of the upper radial, and the hind wing at the end of the first submedian. The wings are much darker below than in *faunus*, without large pale spots, at most sprinkled with white scales. Expanse 2.00–2.30 inches.

Occurs in British Columbia, Washington, and Oregon.

The life history of this species is not as yet known. It is highly probable that the insect has the same tastes as the other species of the genus, and lives upon much the same food-plants. The late W. G. Wright, who was a careful observer, states that the butterfly haunts partially wooded places upon hillsides in the region where it is found. It is to be hoped that some bright young person in Oregon or Washington may succeed in breeding the larvæ to maturity, giving us an account of his observations. It is a mistake to suppose that everything which is worth knowing is already known about our lepidoptera. There is much for the students of the future to find out.



PL. XXIX



(5) *Grapta progne* (Cramer), Plate XXIX, ♂ (The Currant Angle-wing).

Somewhat smaller than any of the foregoing species. Fore wings light fulvous shading into yellow outwardly. The dark markings are smaller than in the other species, but pronounced and clearly defined. Wings below very dark, sprinkled with lighter scales. Expanse 1.85–2.00 inches.

The larva feeds upon all kinds of plants belonging to the currant family.

Ranges from Siberia to Nova Scotia, thence south to the latitude of Pennsylvania.

GENUS VANESSA FABRICIUS
(THE TORTOISE-SHELLS).

Butterflies of medium size. Eyes hairy; palpi somewhat heavily scaled; cell of fore wings may or may not be closed, that of hind wing always open. Fore wings more or less excavated about middle and somewhat produced at ends of upper radial and first median, but not so strongly as in *Grapta*. Hind wings, with outer margin toothed at ends of veins and strongly produced at end of third median nervule. *Eggs* short, ovoid tapering above, and having a few narrow longitudinal ribs, which increase in depth upward; laid in large clusters. *Caterpillars* when mature, cylindrical, with longitudinal rows of branching spines. Feeding upon elms, willows, and poplars. *Chrysalis* not unlike that of *Grapta*.

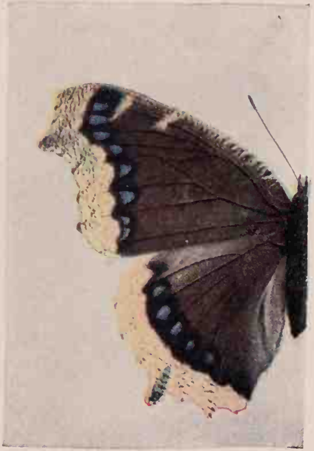
The genus is restricted to the north temperate zone and the colder mountain regions of subtropical lands. The butterflies hibernate, and are among the first to be seen in the springtime.

(1) *Vanessa antiopa* (Linnæus), Plate XXX, ♀ (The Mourning Cloak, The Camberwell Beauty).

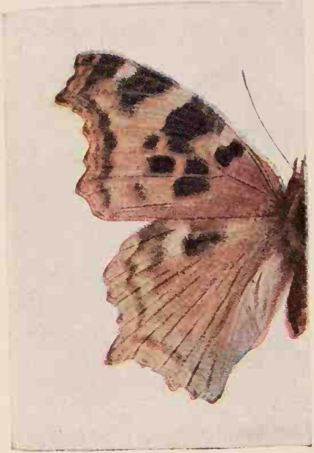
This familiar insect needs no description. It occurs everywhere in the north temperate zone. Eggs laid in large masses on willows, poplars, and elms. There are two broods in the Middle States, the second hibernating under eaves and in hollow trees. Expanse 2.75–3.25 inches.

There is a rare variety of this insect in which the yellow border becomes broad, reaching the middle of the wings. Only two or three such "sports" are known, one in the possession of the author. There are some collectors who set great store by such "freaks" or "aberrations," as they are called.

PL. XXX



PL. XXXI



(2) *Vanessa j-album* Boisduval & Leconte, Plate XXXI, ♂ (The Compton Tortoise).

No description is necessary as our figure will enable it to be immediately recognized. A close ally of the European *Vanessa vau-album.* Expanse 2.60–2.75 inches.

Larva feeds upon willows. Confined to the northern parts of the country, only occurring in Pennsylvania upon the summits of the higher mountains, and ranging thence to Labrador in the east and to Alaska in the northwest.

(3) *Vanessa milberti* Godart, Plate XXXII, ♀ (Milbert's Tortoise-shell).

Easily distinguished by the broad yellow submarginal band on both wings, shaded outwardly by red. Expanse 1.75 inch The larva feeds upon nettles (*Urtica*).

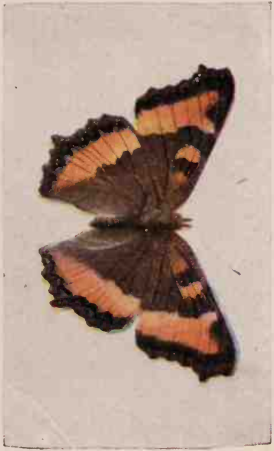
Found at high elevations in the Appalachian highlands, ranging northward to Nova Scotia and Newfoundland, thence westward to the Rocky Mountains and the Pacific Coast, its distribution being determined by temperature and the presence of its food-plant, though its distribution seems to be more dependent upon climate than upon food, as nettles abound in the Southern States, where the insect is never found.

In addition to the three species of *Vanessa*, which we have figured upon our plates, it should be mentioned that there is a very pretty species, known as *Vanessa californica*, which occurs upon the Pacific Coast. It somewhat closely resembles the European *Vanessa urticæ*. In southern California it is only found upon the mountains, but about Vancouver and elsewhere in British Columbia it occurs at sea-level. It is a pugnacious little thing, and fights at sight any other butterfly which comes near. The food-plant of the larva is *Ceanothus thyrsiflorus*. W. G. Wright informs us that the butterfly in the spring delights to feed upon the gum of *Abies concolor*, when it is still fluid.

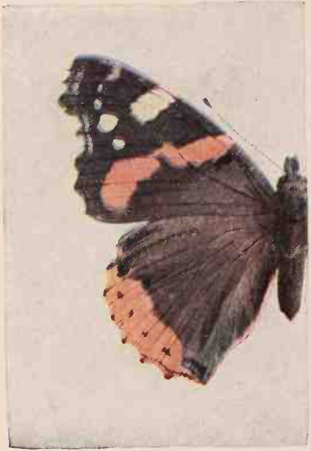
GENUS PYRAMEIS DOUBLEDAY
(THE RED ADMIRAL AND PAINTED LADIES).

The *butterflies* of this are like those of the last genus in the structure of their wings, except that the hind wings are not angulate, and below the hind wings are generally marked with eye-like spots. *Egg* ovoid, closely resembling that of *Vanessa*. Larva like that of *Vanessa*, but spines relatively not so large and not so distinctly branching. Form of *chrysalis* very like

PL. XXXII



PL. XXXIII



that of *Vanessa.* The genus includes comparatively few species, but most have a very wide range, *Pyrameis cardui* being almost cosmopolitan in its distribution, having a wider range than that of any other butterfly.

(1) *Pyrameis atalanta* (Linnæus), Plate XXXIII, ♀ (The Red Admiral).

This familiar butterfly is found throughout temperate North America, Europe northern Africa, and temperate Asia. Expanse 2.00–2.50 inches.

Larva feeds on the leaves of hop vines, on nettles, and *Bœhmeria.*

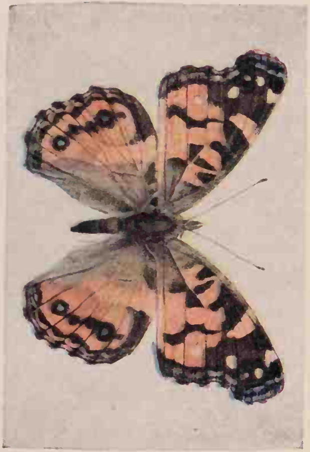
(2) *Pyrameis huntera* (Fabricius), Plate XXXIV, ♂ (Hunter's Butterfly).

Marked much like *P. cardui,* but easily discriminated from it by the two large eye-like spots on the under side of the hind wings. Expanse 2.00 inches.

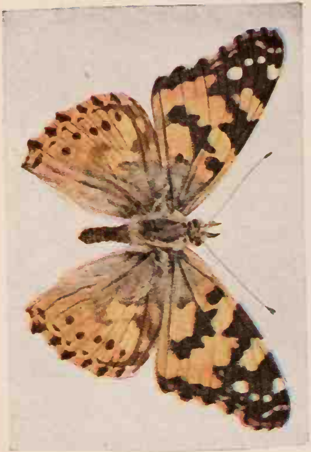
Caterpillar feeds on cud-weed (*Gnaphalium*) and *Antennaria.* Ranges from Nova Scotia to Mexico and Central America, being comparatively rare in California, but more abundant east of the Sierras.

We all know Hunter's Butterfly. How many know that its name commemorates that of a most remarkable American, John Dunn Hunter? Captured by the Indians in his infancy, he never knew who his parents were. He was brought up among the savages. Because of his prowess in the chase they called him "The Hunter." Later in life he took the name of John Dunn, a man who had been kind to him. He grew up as an Indian, but after he had taken his first scalp he forsook the red men, no longer able to join them in their bloody schemes. He went to Europe, amassed a competence, became the friend of artists, men of letters, and scientists. He was a prime favorite with the English nobility and with the King of England He interested himself in securing natural history collections from America for certain of his acquaintances, and Fabricius named the beautiful insect shown on our plate in his honor. His *Memoirs of Captivity Among the Indians* are well worth reading. In that charming book, *Coke of Norfolk and His Friends*, which recently has been published, there are some most interesting reminiscences of this American gentleman, for gentleman he was, although reared by savages. The presumption is established that his unknown progenitors were gentlefolk. "Blood will tell."

PL. XXXIV



PL. XXXV



(3) *Pyrameis cardui* (Linnæus), Plate XXXV, ♀ (The Painted Lady; The Thistle Butterfly).

Easily distinguished from the preceding by the numerous and much smaller eye-spots forming a band on the under side of the hind wings. Expanse 2.00–2.25 inches.

Found all over the world, except in the tropical jungles of equatorial lands.

The caterpillars feed on various species of thistles, nettles, and marshmallows.

Genus JUNONIA Hübner

(Peacock Butterflies).

Medium-sized *butterflies* with eye-spots on upper side of wings. Neuration almost exactly like that of the genus *Pyrameis*, save for the fact that the cell of the fore wing is usually, and of the hind wing always, open. *Egg* broader than high, flattened on top and adorned by ten very narrow and low vertical ribs. *Caterpillars* cylindrical, longitudinally striped, and with several rows of branching spines. *Chrysalis* arched on back, curved inwardly in front, and somewhat bifid at head, with the two projections rounded.

There are a score of species, most of which are found in the tropics of the Old World. Three occur in our region, two of which are found in the extreme south. The one which is common we have figured.

(1) *Junonia cœnia* Hübner, Plate XXXVI, ♂ (The Buckeye).

The spots of the upper side reappear on the lower side, but are much smaller, especially on the hind wings. Expanse 2.00–2.25 inches.

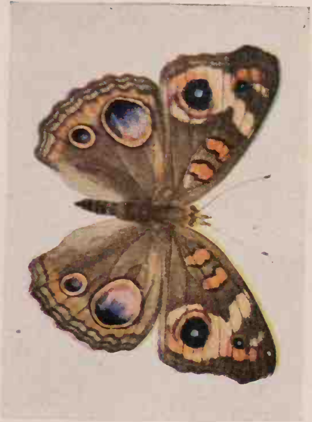
The larva feeds most commonly on plantains (*Plantago*), snapdragons (*Antirrhinum*), and *Gerardia*.

Very common in the Southern States, ranging as far north as New England, west to the Pacific, and south into South America.

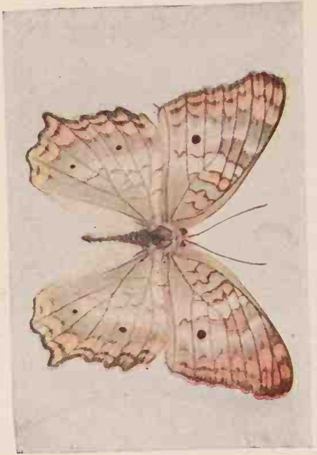
GENUS ANARTIA DOUBLEDAY.

Medium-sized butterflies, having a weak, hovering flight, and keeping near the ground. Palpi have the second joint thick, the third joint tapering, lightly clothed with scales. Fore wings rounded at apex, the outer and inner margins lightly excavated, cell closed by a feeble lower discocellular,

PL. XXXVI



PL. XXXVII



which often is wanting, thus leaving the cell open. Outer margin of hind wings sinuous, produced at end of third median nervule, cell open. First and second subcostal nervules in fore wing fuse with costal.

There are four species of this genus, one of which occurs in the United States, the rest being found in tropical America.

(1) *Anartia jatrophæ* (Linnæus), Plate XXXVII, ♂ (The White Peacock).

The figure we give will readily serve to identify this insect, which occurs in Florida and Texas, and ranges thence southward to Argentina. Expanse 1.75–2.00 inches.

GENUS EUNICA HÜBNER

(THE VIOLET-WINGS).

Rather small butterflies. Antennæ long and slender, with enlarged club, having two grooves. Third joint of palpi of female longer than that of male. The fore wing has the costal and median vein enlarged and swollen at the base. The upper discocellular vein is wanting, the cell is lightly closed. The hind wing is rounded, with its outer margin entire.

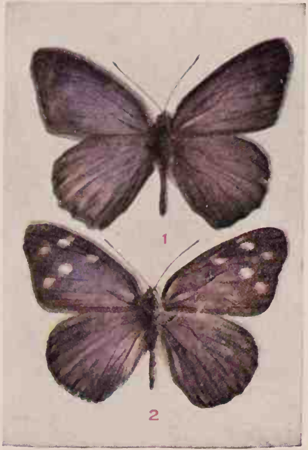
The species of the genus have the upper side of the wings dark brown or black glossed with violet, blue, or purple. Below the wings are very beautifully marked. There are about seventy species which have been described, all of them from the American tropics, two of which, however, come within our borders, *Eunica tatila*, occurring in Florida, and the following:

(1) *Eunica monima* (Cramer), Plate XXXVIII, Fig. 1, ♂; Fig. 2, ♀ (The Dingy Purple-wing).
This obscure little butterfly represents its genus in Texas and Florida, and gives but a faint idea of the beauty of many of its congeners. It ranges southward and is common in Mexico and the Greater Antilles. Expanse 1.35–1.50 inch.

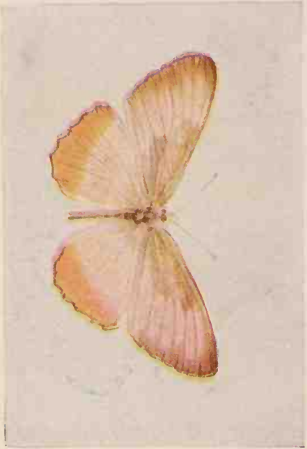
GENUS CYSTINEURA BOISDUVAL
(THE BAG-VEINS).

Small, delicate butterflies with elongated fore wings, having the costal vein much swollen near the base, somewhat as in the *Satyrinæ*. The upper discocellular is lacking in the fore wing, and the cell is feebly closed. Outer margin of the hind wing

PL. XXXVIII



PL. XXXIX



feebly crenulate; cell open; the two radials spring from a common point.

A number of species and local races have been described.

(1) *Cystineura amymone* Ménétries, Plate XXXIX, ♂ (The Texas Bag-vein).

On the under side the gray markings of the upper side are replaced by yellow, and on the hind wings there is a transverse white band near the base and an incomplete row of white spots on the limbal area. Expanse 1.50 inch.

Ranges from Kansas southward through Texas into Central America.

GENUS CALLICORE HÜBNER
(THE LEOPARD-SPOTS).

Small butterflies; the upper side of the wings dark in color marked with bands of metallic blue or silvery green, the lower side more or less brilliantly colored, the fore wings of some shade of crimson or yellow, banded near the apex, the hind wings silvery white or some pale tint, with circular bands of black enclosing round or pear-shaped black spots.

There are about thirty-five species of the genus thus far known, all of which are found south of our limits, except the one we figure.

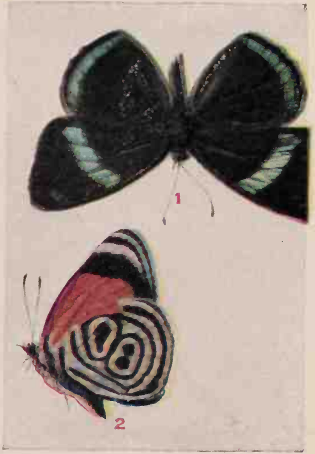
(1) *Callicore clymena* Hübner, Plate XL, Fig. 1, ♂, *upper side;* Fig. 2, ♀, *under side* (The Leopard-spot).

Found in Florida, but though quite common farther south, appears to be rather local and rare in the peninsula. Expanse 1.75 inch.

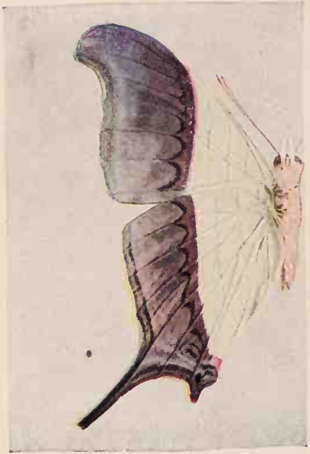
GENUS TIMETES BOISDUVAL (THE DAGGER-WINGS).

Medium-sized butterflies. Palpi moderately long, thickly clothed with scales, the last joint pointed. Fore wing usually somewhat falcate at apex, deeply excavated on outer margin; hind wing greatly produced at the end of the third median nervule, the wings being tailed in such a way as to make them resemble some species of *Papilio*. There is also a prolongation of the outer margin of the wing between the extremity of the submedian vein and the first median nervule. On the upper side the wings are generally dark in color, often marked with

PL. XL



PL. XLI



transverse bands and lines; on the lower side they are light in color, with pronounced darker bands.

Of the thirty species thus far known four occur within our territory, all of them being found far south.

(1) *Timetes coresia* (Godart), Plate XLI, ♂, *under side* (The Waiter).

Easily recognized by the figure we give. As I stated in "The Butterfly Book" it deserves the trivial name I have given it, its black upper side and the white vest it wears suggesting the functionary who attends us at table. Expanse 2.50 inches.

Occasionally found in Texas.

GENUS HYPOLIMNAS HÜBNER
(THE TROPIC QUEENS).

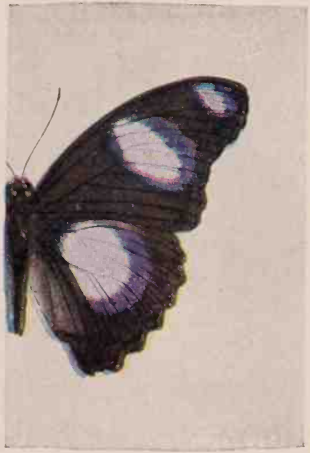
Large butterflies, our species being one of the smallest of the genus. Palpi produced, heavily scaled, rising above the head. Fore wings excavated on the outer margin; costal and median veins stout; upper discocellular vein wanting, and lower discocellular feeble or lacking. Hind wings somewhat crenulate on the outer margin, the cell, which is relatively quite small, being feebly closed by an attenuated veinlet.

The genus, which is quite large, reaches its greatest development in the tropics of the Old World, and there is only one species in the western hemisphere, which may have been introduced in the old days of the slave trade. Most of the species are mimics and the strange thing is that the mimicking form is generally the female, which has the color and markings of some one or other of the milkweed butterflies of the African and oriental tropics. The female of our species patterns after the markings of *Danais chrysippus*, a common milkweed butterfly of Africa. This adaptation of species to the form and color of "protected" insects is of course not *conscious*. It is the result of a long evolution in past ages.

(1) *Hypolimnas misippus* (Linnæus), Plate XLII, ♂; Plate XLIII, ♀ (The Mimic).

Occurs in Florida, the Antilles, and northern South America. While very abundant in Africa, it seems to be scarce in the New World. The female differs greatly from the male on the upper side of the wings, but resembles that sex on the lower side. Expanse ♂, 2.50 inches; ♀, 3.00 inches.

PL. XLII



PL. XLIII

GENUS BASILARCHIA SCUDDER
(THE WHITE ADMIRALS).

Rather large *butterflies.* Fore wings subtriangular, rounded at the apex, and lightly excavated on the lower two thirds of the outer margin. Hind wings rounded, somewhat crenulate. *Egg* nearly spherical (see Plate C, Fig. *f*) pitted with large hexagonal cells. The *caterpillar* in its mature state cylindrical, with the second segment adorned with two prominent club-shaped tubercles, and the fifth, ninth, and tenth segments also having raised tubercles (see Plate C, Fig. *h*). They feed upon oaks, birches, willows, and lindens, preferably the two latter. The caterpillars after hatching hibernate in little winter quarters, which they make out of the fragment of a small leaf, which they tie together with silken threads, and also secure to the twig by a few strands. The *chrysalis* has a projecting boss on the back; the head is either rounded or slightly bifid.

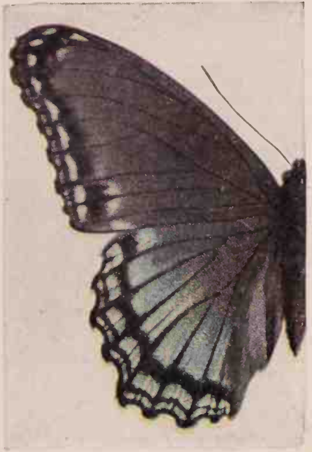
There are a number of species in the United States, several of which mimic other butterflies in a singular manner, *B. disippus* closely resembling *Anosia plexippus.* The caterpillars do not pupate until summer has come; the butterflies take wing when the lindens bloom.

(1) *Basilarchia astyanax* (Fabricius), Plate XLIV, ♀ (The Red-spotted Purple).

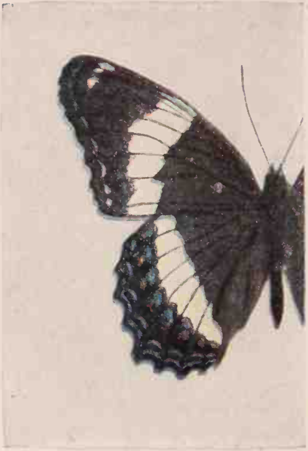
Our figure gives a good idea of the upper side of the wings. On the lower side the wings are brown, banded with black on the margins, the inner row of marginal spots being red, with two red spots at the base of the fore wings, and four such spots at the base of the hind wings. Palpi white below; a white stripe along the sides of the abdomen. Expanse 3.00–3.25 inches. The egg and caterpillar are shown on Plate C. The caterpillar is found on a variety of plants, but most commonly on lindens, willows, and wild cherry trees.

Found all over the United States and Canada, as far west as the Rocky Mountains, but not in the very hot lowlands of the Gulf region. Is said to occur on the uplands of Mexico.

Between *B. astyanax* and the following species, *B. arthemis*, there is more or less affinity. They represent two lines of evolution from a common ancestry, and there are evidences of atavic reversion to type constantly occurring in both forms. They even occasionally interbreed with each other, and hybrids are not altogether uncommon. The whole genus in fact is in a more or less plastic state, and well deserves the careful attention of biologists.



PL. XLV

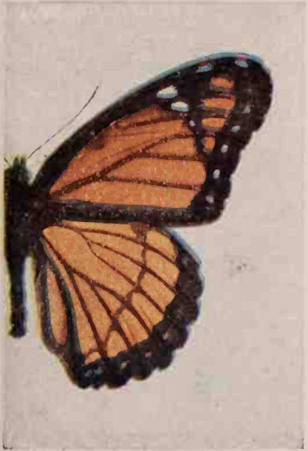


(2) *Basilarchia arthemis* (Drury), Plate XLV, ♂ (The Banded Purple).

Our figure shows the upper side of the form which is most usual. It will be seen that there are red spots on the hind wings behind the white band. There is a variety called *proserpina* in which the white band becomes very narrow and the red spots almost or entirely disappear. When the white band and the red spots wholly disappear, as they sometimes do, it is almost impossible to distinguish this species from *B. astyanax*. Expanse 2.50–2.75 inches. The egg has "kite-shaped" cells. The caterpillar feeds on willows, hawthorns, and wild apple and plum trees.

Found in Canada, New England, and southward in Pennsylvania upon the higher ranges of the mountains. It is a northern form. It has not thus far been recorded from the western half of the continent, where it is replaced by a somewhat similarly marked, but larger, species, known as *B. Weidemeyeri*. The latter insect is found as far east as western Nebraska and Colorado. I have taken it very frequently in Wyoming about Laramie Peak, where it seems to be a common insect in the wooded canyons.

PL. XLVI



(3) *Basilarchia disippus* (Godart), Plate XLVI, ♂; Plate C, Fig. *f*, egg; Fig. *h*, larva. (The Viceroy).

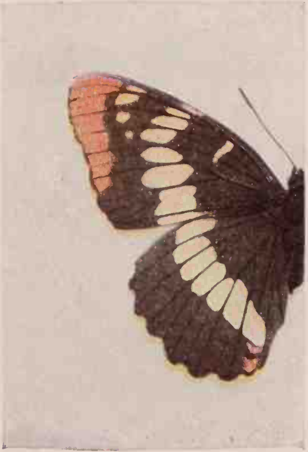
Mimics *Anosia plexippus.* Range from Canada to the Gulf.

This is one of the most striking cases of mimicry which occurs in our fauna.

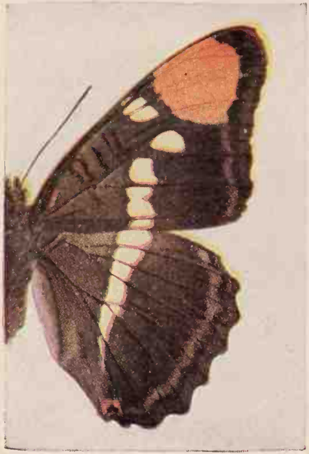
(4) *Basilarchia lorquini* (Boisduval), Plate XLVII, ♂ (Lorquin's Admiral).

Easily distinguished by white bar at end of cell of fore wing and red spot at apex. Expanse 2.25–2.75 inches.

PL. XLVII



PL. XLVIII



Genus ADELPHA Hübner (The Sisters).

Cell of fore wing lightly closed, of hind wing open; outer margin of wings rarely excavated. The chrysalids have peculiar forms, having bifid heads and broad wing-cases; marked with metallic spots on a brown ground.

There are many species in tropical America, some of which are very showy; only one occurs within our limits.

(1) *Adelpha californica* Butler, Plate XLVIII, ♂ (The Californian Sister).

The insect, well displayed in our figure, has an expanse of from 2.50–3.00 inches. The caterpillar feeds upon oaks. The range is through southern California, Nevada, southern Utah, Arizona, and Mexico.

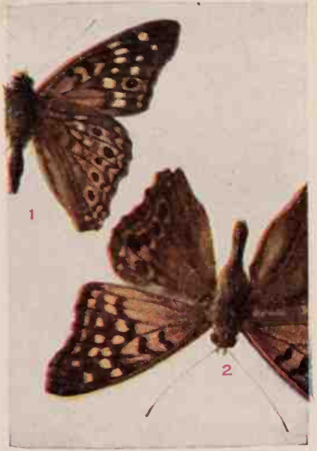
Genus CHLORIPPE Boisduval (The Emperor Butterflies).

Small *butterflies* generally of some shade of fulvous, with a submarginal row of eye-like spots on the hind wings, and in a few species with a similar spot on the fore wings. The apex of the fore wing is somewhat truncated and the lower two thirds is slightly excavated. Hind wings somewhat elongated posteriorly at the anal angle. Outer margins more or less crenulate. *Eggs* nearly globular, broad on top, ornamented with eighteen to twenty broad, but low, vertical ribs, between which are delicate crosslines; laid in clusters. Head of *caterpillar* squarish, crowned by two diverging spines on which are many little spinules. Back of the head there is a frill of spines. Body thickest at the middle, tapering fore and aft. Hind pair of pro-legs long and diverging. They feed upon hackberry trees (*Celtis*). The *chrysalis* has a very remarkable arrangement of the cremaster, which is disk-like, studded with hooks; the whole so arranged that the pupa, when suspended, hangs with the ventral or belly side parallel to the supporting surface.

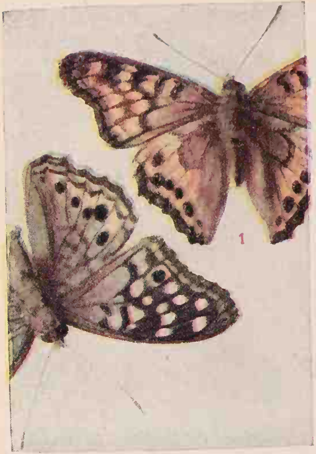
There are numerous species in the genus, many of them tropical and very brilliant, only two commonly occur in the northern portions of our territory, the others found within our limits being inhabitants of the Southern States.

(1) *Chlorippe celtis* Boisduval & Leconte, Plate XLIX, Fig. 1, ♂ (The Hackberry Butterfly).

Under side grayish purple, with the spots and markings of



PL. L



the upper side reappearing. Female larger, and, as always is the case in the genus, with the fore wings not so pointed as in the male, and the ground-color paler. Expanse ♂, 1.80 inch; ♀, 2.10 inch.

Ranges from New Jersey west and south to the Gulf.

(2) *Chlorippe clyton* Boisduval & Leconte, Plate XLIX, Fig. 2, ♂ (The Tawny Emperor).

A larger species than the preceding; tawnier on the upper side of the wings and lacking the red-ringed eye-spot on the fore wing. Female much larger than the male, paler in color, with the eye-spots on the hind wings black and conspicuous. Expanse ♂, 2.00 inches; ♀, 2.50–2.65 inches.

Occurs rather rarely in New England, and extends westward to Michigan, thence southward to the Gulf of Mexico.

(3) *Chlorippe flora* Edwards, Plate L, Fig. 1, ♂, *Type* (The Red Emperor).

Like *C. clyton* this species has no red-ringed eye-spot on the fore wing. The ground-color on the upper side is bright reddish fulvous; the hind wings are not heavily obscured with brown, as is the case in *C. clyton*, and the black ocelli stand forth very prominently upon the lighter ground. The hind wings are more strongly angulated than in any other North American species, and are solidly bordered with black. Expanse ♂, 1.75; ♀, 2.35 inches. Ranges from Florida westward along the borders of the Gulf of Mexico to Texas.

(4) *Chlorippe alicia* Edwards, Plate L, Fig. 2, ♂, *Type* (The Buff Emperor).

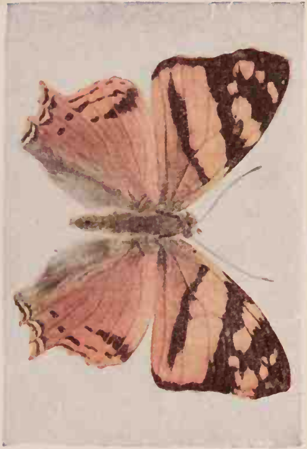
Resembles *C. celtis* in having an ocellus in the fore wing, but it may at once be distinguished by its larger size in both sexes, the paler color of the wings on the upper side, which shade from pale fulvous at the base into light buff outwardly, upon which the eye-spots on the hind wings show up very prominently. Expanse ♂, 2.00; ♀, 2.50 inches.

The range of this species is the same as that of the preceding.

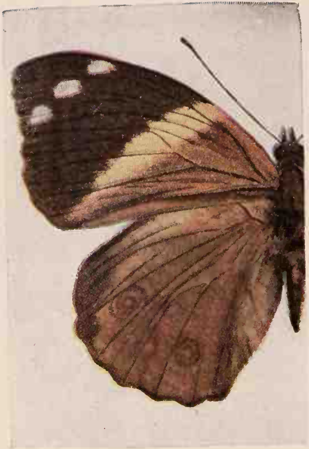
GENUS HYPANARTIA HÜBNER (THE BANDED REDS)

Medium-sized butterflies. Palpi well clothed with scales, the second and third joints very nearly of the same size, the latter blunt. Fore wings square at the apex, slightly excavated about the middle, the cell being closed by a stout lower discocellular vein, more or less continuous with the third median nervule. Hind wing strongly produced at the end of the third

PL. LI



PL. LII



median nervule, rounded at the outer angle, with two short tooth-like projections before the anal angle.

There are less than a dozen species of the genus, most of which are South American, but there are two in Africa and one in Madagascar. Only one occurs within the United States, and is confined to the extreme south.

(1) *Hypanartia lethe* (Fabricius), Plate LI, ♂ (The Orange-banded Red).

Occurs as a straggler in our fauna in the extreme southern part of Texas, but is very abundant farther south. Expanse 2.00 inches.

GENUS SMYRNA HÜBNER

There are only two species of this genus and they closely resemble each other, so that it is hard to tell them apart. The one which occurs in our borders has the hind wing rounded at the anal angle, the other, *S. blomfildi*, has the anal angle of the hind wing squared, with a slight tail-like prolongation. On the under side both species are marked in much the same way.

(1) *Smyrna karwinskii* Hübner, Plate LII, ♀ (Karwinski's Beauty).

The insect may be at once recognized by the figure we give. Expanse 3.00–3.25 inches.

It occurs in southern Texas and ranges southward into Brazil.

GENUS CŒA HÜBNER

This is a monotypic genus, that is to say, it contains only one species. It is therefore not necessary to take up much space in describing it, because the figure we give will enable the reader at once to recognize it. It is a very powerful insect on the wing.

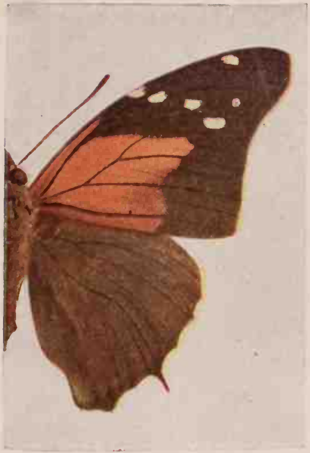
(1) *Cœa acheronta* (Fabricius), Plate LIII, ♂ (The Dashwing).

This lovely insect, which has a certain resemblance to the following species, is common in the Greater Antilles, Mexico, and Central America. It occurs about Brownsville, Texas, but is not common there. Expanse 3.00–3.25 inches.

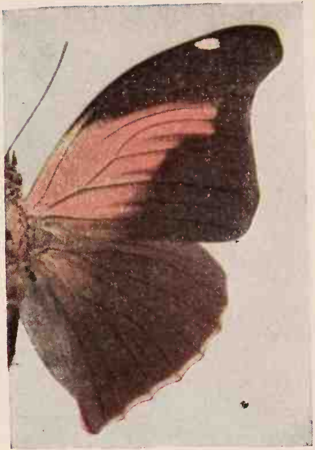
GENUS AGANISTHOS BOISDUVAL

The genus, like the preceding, is monotypic, and contains but the one species *A. odius* (Fabricius). It is so striking and

PL. LIII



PL. LIV



so easily recognizable by the figure we give on Plate LIV that nothing more need be said, except that it has a wide range through the American tropics, being found in southern Florida and Texas, the Greater Antilles, and from Mexico to southern Brazil. Expanse 3.75–4.00 inches.

GENUS PYRRHANÆA SCHATZ

Medium-sized *butterflies*. Front wings falcate at apex; hind wings tailed at end of third median nervule. Costal margin of fore wing angulated at base, inner margin straight. Upper side of wings generally fulvous or red; lower side mottled and marked so as to resemble dried leaves. *Egg* spheroid, flattened at base, depressed on top, marked with a few rows of raised points about summit. *Caterpillar* with head globular, first segment behind it much smaller than head; body cylindrical tapering behind. *Chrysalis* short, stout, keeled on sides; cremaster globular at tip, and so arranged as to cause the chrysalis to hang at a slant.

This is a large genus characteristic of the American tropics. The larvæ feed on euphorbiaceous and lauraceous plants, after the third moult making hiding-places for themselves by rolling up leaves and tying them with silk. There are three species in the United States, two of which we figure.

(1) *Pyrrhanæa andria* (Scudder), Plate LV, ♂ (The Goatweed Butterfly).

Bright red above, margins dusky; on under side gray dusted with brown scales. Females marked by incomplete pale bands on the limbal area. Expanse ♂, 2.50; ♀, 3.00 inches. Larva feeds on *Croton capitatum*. Ranges from Illinois and Nebraska to Texas.

(2) *Pyrrhanæa morrisoni* (Edwards), Plate LVI, ♀ (Morrison's Goatweed Butterfly).

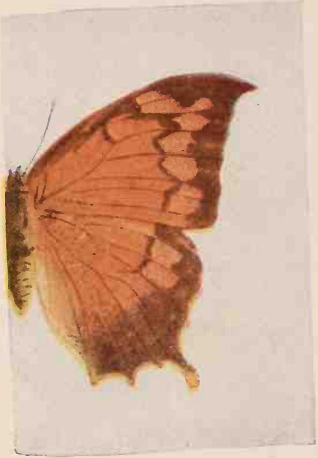
More brilliantly and deeply red on upper side than preceding species. Both male and female have the wings with bands of lighter color on the limbal area, but these are not solid, as in the female of *P. andria*, but made up of spots, as shown in the figure. Expanse 2.25–2.50 inches.

Found in Arizona and Mexico.

The genus which is here engaging our attention is one which is wonderfully well represented in the New World, where it takes the place of the magnificent insects belonging

PL. LV

PL. LVI



to the genus *Charaxes* of the tropics of the Old World. On the under side they closely mimic dried leaves. This assimilation to the color of dead leaves is protective.

Genus AGERONIA Hübner (The Calicoes).

Medium or moderately large-sized butterflies. Costal and subcostal fused near base; cells of both wings closed. Upper side of wings curiously marked with checkered spots, generally some shade of blue with white; under side with broad paler shades: white, yellow, or red. They are rapid fliers, alight on the trunks of trees head downward, wings expanded against the bark of the tree. When they fly they make a clicking sound with their wings. The manner in which this sound is produced is a mystery. Bates in his *A Naturalist on the Amazons* writes about it but gives no explanation. In my rambles in tropical forests I have heard it as the insects gyrated above my head, but I do not know how the sound is made.

There are about thirty species of the genus in tropical America, two of which are occasionally found in southern Texas.

(1) *Ageronia feronia* (Linnæus), Plate LVII, ♂ (The White-skirted Calico).

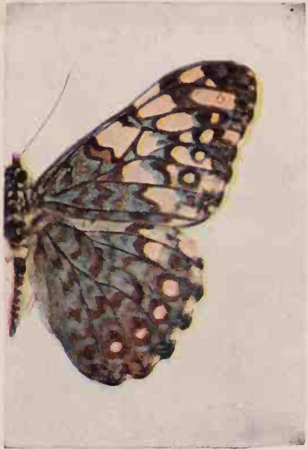
The ground-color of the under side is broadly white, while that of the other species in our fauna, *A. fornax,* is yellow. They may thus be easily told apart.

GENUS VICTORINA BLANCHARD
(THE MALACHITES).

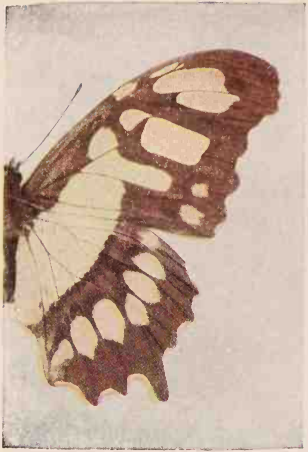
Large butterflies, conspicuously marked with pale green spots surrounded by darker color. On the under side the wings are paler, and have a satiny lustre, the edges of the light spots on this side marbled with brown. Neuration of fore wing singular in that the upper and lower discocellulars are wanting and the radials seem to spring from the lower side of the subcostal before the middle; the third median is strongly bowed upward. Hind wing tailed at end of the third median nervule.

There are five species of the genus thus far known, all belonging to the American tropics, one of which occurs in Florida and Texas.

PL. LVII



PL. LVIII



(1) *Victorina steneles* (Linnæus), Plate LVIII, ♂ (The Pearly Malachite).

There is no need of an elaborate description of this species, as it is the only one of its genus in our borders, and the figure we give is fully recognizable. Expanse 3.50–4.00 inches.

SUBFAMILY SATYRINÆ (THE SATYRS).

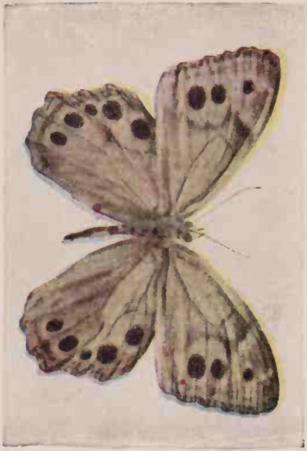
Butterflies generally of medium size, obscure in color, their wings, especially on the under side, ornamented with dark eye-like spots, pupilled in the centre with a light point and ringed around with one or more circles of lighter color. They have a weak flight, dancing about in the herbage and often hiding among grasses and weeds. Most of them are forest-loving, but some live on the summits of bleak and cold mountains, others on the verge of arctic snows, and some on the prairies. Veins of the fore wings generally greatly swollen at the base, thus enabling them to be distinguished from almost all other butterflies. *Eggs* subspherical, somewhat higher than broad, ribbed on the sides, particularly at the apex, and rounded at the base. *Caterpillars,* when they emerge from the egg, have their heads much bigger in diameter than the rest of the body, but as they mature they lose this feature, and generally taper from the middle of the body in either direction. Anal pro-legs bifurcating, thus readily distinguished from all other caterpillars, except those of the genus *Chlorippe*. They feed upon grasses and sedges, concealing themselves in the day-time and coming forth to feed at night. *Chrysalids* short and stout, plain both in color and outline.

There are about sixty species of *Satyrinæ* in the region with which this manual deals, falling into ten genera. We shall only deal with the commoner species.

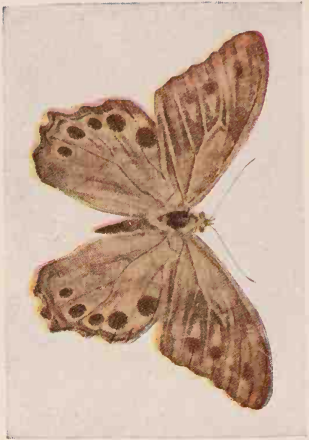
GENUS DEBIS WESTWOOD
(THE EYED NYMPHS).

This is a large genus, especially well represented in Asia and the Indo-Malayan region. Dr. S. H. Scudder set apart the two species we have in our fauna from the Asiatic forms, under the new name *Enodia*, but I have never been able to see any good reason for this, and keep the generic name as it has long stood. The creation of new genera upon the basis of slight differences is to be deprecated and avoided.

PL LIX



PL. LX



(1) *Debis portlandia* (Fabricius), Plate LIX, ♂ (The Pearly Eye).

The butterfly which is well depicted in our figure has a series of beautiful ocelli on the under side. There is no great difference between the sexes. In the Northern States it is single-brooded, in the South it is double-brooded. Expanse of wing 1.75–2.00 inches.

The caterpillar feeds on grasses. The insect ranges from Maine to the Gulf, and westward to the Rocky Mountains.

(2) *Debis creola* Skinner, Plate LX, ♂ (The Creole).

Easily distinguished from the foregoing by the elongated patches of dark raised scales upon the fore wings. Expanse 2.25 inches. The specimen figured is a paratype received from the author of the species.

Ranges from Florida to Mexico along the Gulf.

GENUS SATYRODES SCUDDER

(THE GRASS-NYMPH).

This genus was erected by its author to receive the single species, which we figure. As there is no likelihood of mistaking it for anything else, we forego a long generic description.

(1) *Satyrodes canthus* (Boisduval & Leconte), Plate LXI, ♀ (The Grass-nymph).

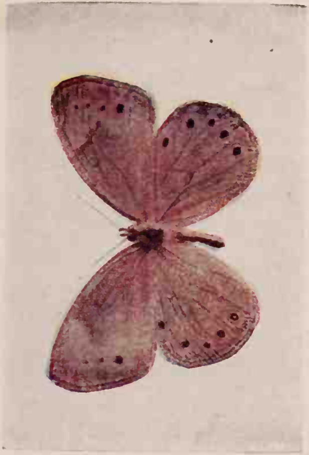
The butterfly always haunts meadows and hides among tufts of tall grass in moist places. It is quite common in New England and Canada, and is found in the cool regions of the Appalachian uplift as far south as North Carolina. It has a peculiar jerking flight, and is easily captured. Expanse 1.65-1.90 inch.

The caterpillar feeds on grasses, and its early stages and transformations have often been described.

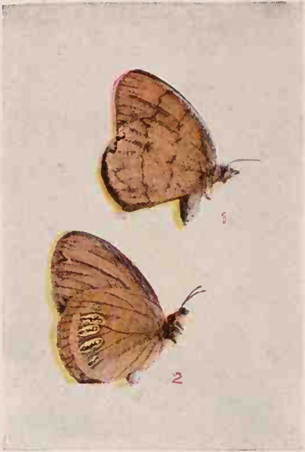
GENUS NEONYMPHA WESTWOOD
(THE SPANGLED-NYMPHS).

Small *butterflies*, rather obscure in color. Both fore and hind wings evenly rounded; the fore wings with the costal and median veins much swollen at the base. Antennæ short without a distinctly defined club. *Egg* globular marked with polygonal cells. *Caterpillar* with a large head, bifid above, and produced as two cones thickly studded with little raised projections. *Chrysalis* comparatively long, pointed at the head, with a blunt tubercle on the thorax; green.

PL. LXI



PL. LXII



Some writers maintain that this genus is identical with the genus *Euptychia* Hübner, which contains over one hundred species, principally found in the American tropics. Seven species are found in our region, of which we shall delineate five.

(1) *Neonympha gemma* (Hübner), Plate LXII, Fig. 1, ♂, *under side* (The Gemmed Brown).

The upper side of the wings are mouse-colored, with a couple of twinned dark spots on the outer margin of the hind wings. On the under side the wings are reddish gray, marked with irregular rusty lines, and at the point where the dark spots appear upon the upper side there is a row of silvery spots. Expanse 1.25–1.35 inch.

Ranges from West Virginia to Mexico.

(2) *Neonympha phocion* (Fabricius), Plate LXII, Fig. 2, ♀ (The Georgian Satyr).

A trifle larger than the preceding species, which it closely resembles above, but from which it may at once be distinguished by the form of the markings of the lower side of the hind wings, which are depicted in our illustration. Expanse 1.25-1.45 inch.

Ranges from southern New Jersey to the Gulf as far west as Texas. Very common in Georgia.

(3) *Neonympha eurytus* (Fabricius), Plate LXIII, ♂ (The Little Wood-satyr).

Readily distinguished from the other species in our fauna by the two well-developed eye-spots on the fore wings, as well as on the hind wings on the upper side. Expanse 1.75 inch.

The caterpillar and chrysalis are pale brown, the latter marked with darker brown.

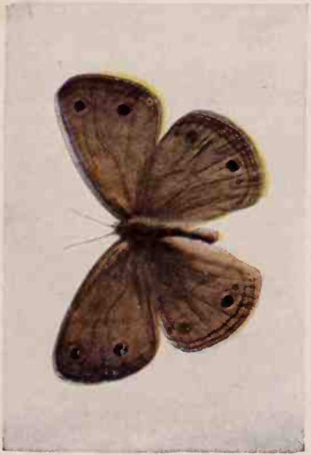
Ranges from New England and Ontario to Georgia and westward to Kansas and Texas.

(4) *Neonympha sosybius* (Fabricius), Plate LXIV, Fig. 1, ♂ (The Carolinian Satyr).

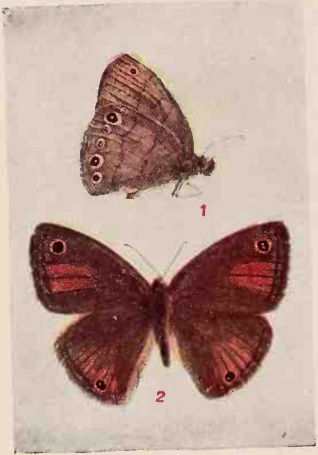
Upper side unspotted dark mouse-gray. On the under side the wings are paler, crossed by three lines, one defining the basal, the second the median area, and the third just before the outer margin. Between the last two are rows of ocelli, which are obscure, except the first on the fore wing and the second and last two on the hind wing. Expanse 1.25–1.50 inch.

Ranges from the latitude of New Jersey southward through

PL. LXIII



PL. LXIV



the lower half of the Mississippi Valley to Mexico and Central America.

(5) *Neonympha rubricata* Edwards, Plate LXIV, Fig. 2, ♂. *Type* (The Red Satyr).

Most nearly related to *N. sosybius*, but readily distinguished by its much redder color, and by having but one eye-spot on the upper side of the fore wing. Expanse 1.40–1.75 inch.

Found in Texas, Arizona, Mexico, and Central America.

GENUS CŒNONYMPHA WESTWOOD
(THE RINGLETS).

Small *butterflies.* Costal, median, and submedian veins of fore wing strongly swollen at base. Both wings evenly rounded on outer margin. *Egg* conical, rounded at the bottom, truncated, with low ribs and cross-lines near the top. The *caterpillar* has a globular head and cylindrical body, which tapers backward from about the middle, and on the last segment has two cone-like backward projections. *Chrysalis* straight ventrally, convex dorsally, with a rounded keeled eminence over the thorax, pointed at the end, green or drab, marked with darker spots.

The genus is found throughout the north temperate zone, and we have in our fauna a number of species and varieties, most of which are confined to the Pacific Coast and to Alaska.

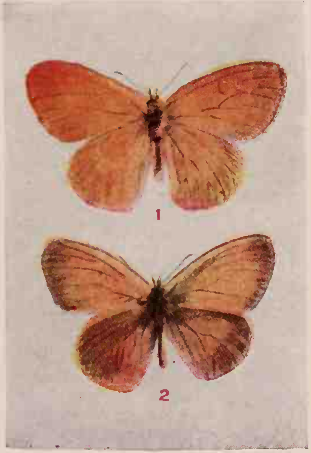
(1) *Cœnonympha ochracea* Edwards, Plate LXV, Fig. 1, ♂ (The Ochre Ringlet).

Glossy ochreous yellow above, without dark markings except as those of lower side faintly show through. On under side the fore wing has an eye-spot near apex, and the hind wing has a submarginal row of incomplete eye-spots, which in some specimens is wanting. Ground-color of under side of fore wings as above; of hind wings gray, interrupted about middle by a lighter band, and lighter rays about the cell near base. Expanse 1.25–1.50 inch. Ranges from British Columbia to Arizona eastward to Kansas and Nebraska.

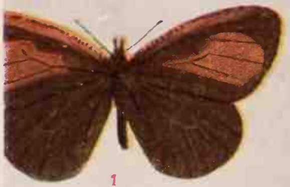
(2) *Cœnonympha inornata* Edwards, Plate LXV, Fig. 2, ♂ (The Plain Ringlet).

Reddish ochraceous on upper side with outer margin of fore wings and hind wings laved with darker. On the under side

PL. LXV



PL. LXVI



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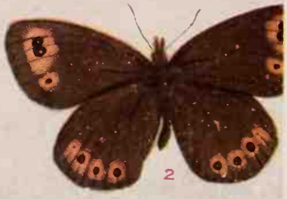


2

there is an ocellus near the apex of fore wing and on the hind wing, which is dark gray, a yellow curved mark beyond the cell and a couple of pale yellow spots near the anal angle. Expanse 1.25–1.50 inch.

Occurs in Montana, Minnesota, Ontario north of Lake Superior, thence eastward to Newfoundland.

Genus EREBIA Dalman (The Alpines)

Rather small *butterflies*, dark in color, with eye-spots on the wings, most numerous on the under side. Veins of fore wing thickened at base; lower radial in some cases projected inwardly into the cell at point of origin. Outer margin of both wings evenly rounded. *Egg* subconical, ribbed, the ribs often intersecting each other. *Larva* with globular head, body tapering backward, last segment bifurcate. *Chrysalis* convex dorsally and ventrally, humped on thorax, produced at head, light brown or ashen gray.

The genus is arctic and confined to the far north, or to the summits of high mountains, which have an arctic climate. There are many species in the northern hemisphere, of which we select two for representation.

(1) *Erebia discoidalis* Kirby, Plate LXVI, Fig. 1, ♂ (The Red-streaked Alpine).

Easily distinguished from all other species in our fauna by the plain dark wings streaked on the costa and suffused over the outer three fourths of the middle of the fore wings with dark red or maroon. Expanse 1.75–2.00 inches.

Habitat region of Hudson Bay, thence westward to Alaska and southward among snowy peaks of British Columbia. Probably found on high mountains of Idaho and Montana.

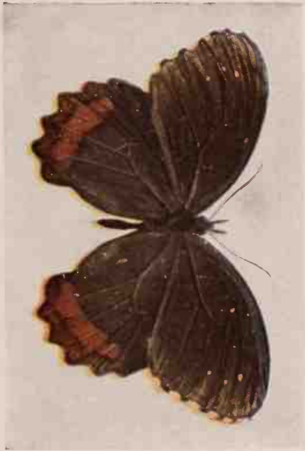
(2) *Erebia epipsodea* Butler, Plate LXVI, Fig. 2, ♂ (The Common Alpine).

The upper side is shown in our cut; the under side repeats the markings of the upper side more or less clearly, and besides has on the hind wing a broad, curved, median, blackish band. Expanse 1.75–2.10 inches.

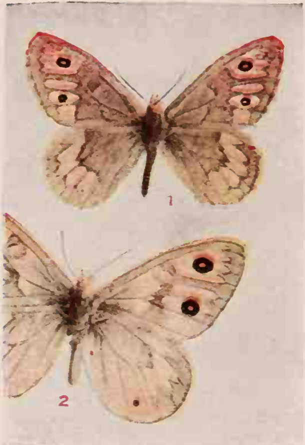
Ranges from the alpine summits of New Mexico northward at suitable elevations to Alaska, where it is common.

Genus GYROCHEILUS Butler
(The Blackamoors).

Medium-sized *butterflies*, very dark in color, with eye-spots on fore wings, and hind wings bordered with brown.



PL. LXVIII



There is only one species found in our region, and a detailed account of its structure may therefore be spared.

(1) *Gyrocheilus tritonia* Edwards, Plate LXVII, ♂ (The Arizona Blackamoor).

Upper side shown in our figure. The under side is much the same, except that the submarginal band is purplish red sprinkled with white and dark brown scales, and has on the inner side a row of imperfectly developed eye-spots partially ringed about on the side of the base by yellow. Expanse 2.25–2.50 inches.

Occurs in southern Arizona and northern Mexico.

GENUS NEOMINOIS SCUDDER

For a detailed account of the structure and metamorphoses of these insects the reader is referred to "The Butterfly Book." There are only two species found in our territory and we give figures of the upper side of both of them, so that the student will be able to recognize them when he gets them.

(1) *Neominois ridingsi* (Edwards), Plate LXVIII, Fig. 1, ♂. *Type* (Ridings' Satyr).

The upper side is well shown in our figure. The under side is paler than the upper, and the basal and mesial areas are mottled with narrow pale brown streaks, while the hind wing is crossed about the middle by a dark band, the outer margin of which is sharply indented. Expanse 1.50 inch. Larva pupates under ground.

Inhabits the mountain states of the Pacific Coast.

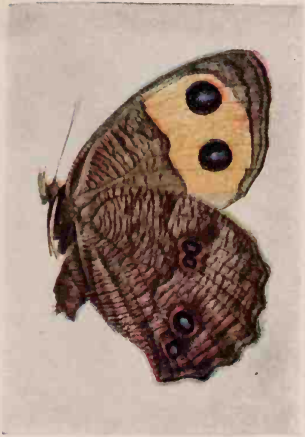
(2) *Neominois dionysius* Scudder, Plate LXVIII, Fig. 2, ♂ (Scudder's Satyr).

On the under side the mesial band of the hind wings is narrower and more irregularly curved than in the preceding species and the outer indentations are more strongly produced. Expanse 1.90 inch. Occurs in Colorado, Utah, and Arizona.

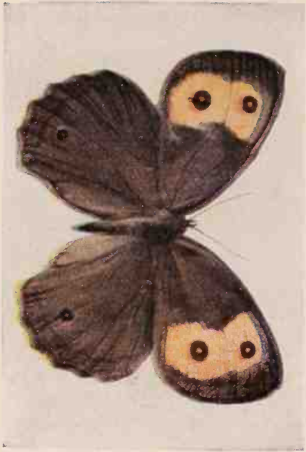
GENUS SATYRUS WESTWOOD (THE WOOD-NYMPHS)

Medium-sized or small *butterflies*. Wings marked with eyespots, or ocelli. On upper side generally very obscurely colored with some shade of gray or brown, occasionally marked by yellow bands; under side frequently beautifully streaked and spotted, with the ocelli more prominent than on the upper side. The veins of the fore wing are much swollen at the base.

PL. LXIX



PL. LXX



The outer margin of the fore wing is evenly rounded, that of the hind wing somewhat scalloped. *Egg* barrel-shaped, truncated on top, ribbed on the sides, the ribs at the top connected by a waved, raised elevation. *Caterpillar* with globular head, cylindrical body, tapering both ways from the middle, and furnished with diverging anal horns. *Chrysalis* in form like those of many of the genera belonging to this subfamily; green in color. The genus is quite large, and many of the species are very variable.

(1) *Satyrus pegala* (Fabricius), Plate LXIX, ♀, *under side* (The Southern Wood-nymph).

Easily recognized by its large size, it being the largest species in our fauna, and by the broad subterminal yellow band on the fore wing marked in the male by one eye-spot, and in the female by two such spots. Expanse 2.75–3.00 inches.

Common in the Gulf States and occasionally occurring as far north as New Jersey.

(2) *Satyrus alope* (Fabricius), Plate LXX, ♀ (The Common Wood-nymph).

Closely resembling the preceding species, but only two thirds its size. The number of the ocelli is not constant, and some specimens lack them entirely. This is the form which is common on the Atlantic seaboard from New Jersey to New Hampshire, and westward to the Mississippi. Expanse 1.75–2.25 inches.

(3) *Satyrus alope* form *nephele* Kirby, Plate LXXI, Fig. 1, ♂ (The Clouded Wood-nymph).

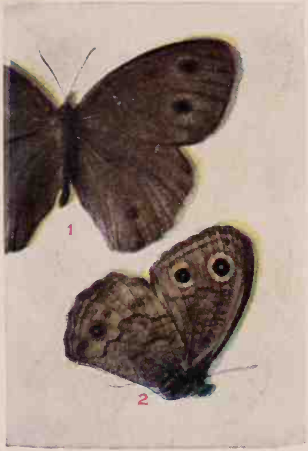
This form, long held to be a valid species, has been ascertained by breeding to be a dimorphic variety characterized by the partial or entire suppression of the yellow band on the fore wings and the tendency of the eye-spots to disappear. It is a northern form, and is common in Canada, northern New England, and in corresponding latitudes from the Atlantic to the Pacific. Expanse 1.85–2.25 inches.

(4) *Satyrus paulus* Edwards, Plate LXXI, Fig. 2, ♂, *Type, under side* (The Small Wood-nymph).

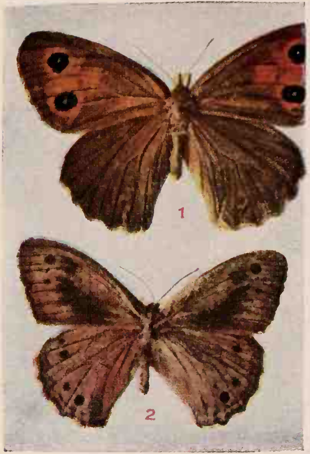
Somewhat smaller than *S. nephele*. Upper side dark brown in both sexes; fore wings always with two ocelli, one near apex, the other near inner angle; hind wing with two ocelli near anal angle. Expanse 1.75–2.00 inches.

Occurs in California and Nevada.

PL. LXXI



PL. LXXII



(5) *Satyrus meadi* Edwards, Plate LXXII, Fig. 1, ♂ (Mead's Satyr).

Readily distinguished from all others by the bright red on the limbal area above and below. Expanse 1.60–1.75 inch.

Ranges from Arizona to Montana in the region of the Rocky Mountains.

(6) *Satyrus charon* Edwards, Plate LXXIII, Fig. 1, ♂, *Type* (The Dark Wood-nymph).

The *type* of the species is darker on the under side of the wings than many specimens in the possession of the writer; the under side is in fact somewhat variable. There may or may not be ocelli on the under side. Mr. Edwards named the form without ocelli *Satyrus silvestris,* but this form is doubtlessly a good species. Both fore and hind wings on the under side are marked abundantly and evenly by little streaks darker in color than the ground, and are crossed on either side of the median area by dark lines, which sometimes are wanting, and are quite variable. Expanse 1.50–1.75 inch.

Ranges from British Columbia to New Mexico, and appears to be common, wherever it occurs.

(7) *Satyrus sthenele* Boisduval, Plate LXXIII, Fig. 2, ♂, *under side* (The Least Wood-nymph).

Quite small, on the upper side resembling *S. charon*, but very different on the under side. The distinguishing mark of the species is the dark, twice-strangulated band of the hind wings, bordered outwardly on either side by lighter shades. This is shown in our figure. Expanse 1.40–1.50 inch.

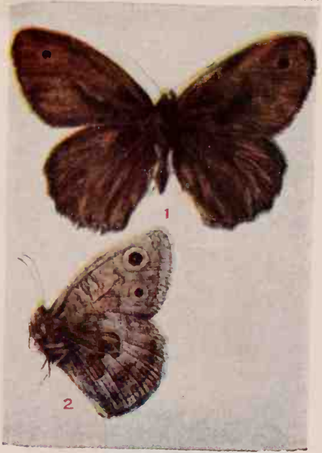
Found in California.

GENUS PARAMECERA BUTLER

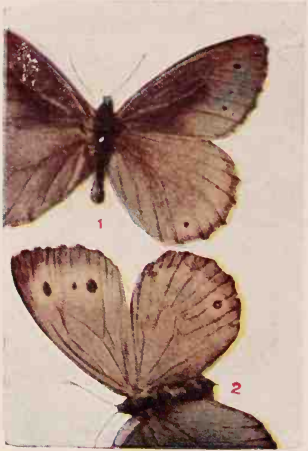
There is only one species in this genus thus far known. The insect closely resembles those of the genus *Satyrus*, but may readily be told apart by the patch of heavy, dark, raised scales in the region of the median nervules of the fore wing. On the under side the insect is paler, ruddy, and the fore wings have a large pupilled eye-spot, followed by a blind, much smaller eye-spot at the apex. The hind wing has a pale mesial band bordered by darker lines and a submarginal row of eye-spots.

(1) *Paramecera xicaque* (Reakirt), Plate LXXII, Fig. 2, ♂ (Reakirt's Satyr).

PL. LXXII



PL. LXXIV



The insect has an expanse of wing varying from 1.35-1.75 inch. It is not uncommon in southern Arizona and northern Mexico.

Genus ŒNEIS Hübner (The Arctics)

Medium-sized *butterflies*, above some shade of light or dark brown; below marbled and mottled, often with a dark median band crossing both wings. The fringes are brown checkered with white. They live in the cold north or on the tops of high mountains. One of the best-known species is the White Mountain Butterfly, *O. semidea*, which exists on the summit of Mt. Washington, New Hampshire. The *eggs* are ovate-spheroid, ribbed, and are laid on dry grasses near the spot where grass will grow in the following spring. The *caterpillars*, when mature, are cylindrical, tapering from the middle both ways, pale green or brown, with darker longitudinal stripes, feeding on grasses. The *chrysalids* are stout, a little angulated, and are formed, unattached, under stones or at the roots of grass in a slight depression where the caterpillar has deposited a few threads of silk.

There are a score or more of species in our fauna, of which most occur on the tops of high northern mountains or near the Arctic Circle.

(1) *Œneis jutta* (Hübner), Plate LXXIV, Fig. 1, ♂; Fig. 2, ♀ (The Nova Scotian).

This species, found also in Europe, is one of the most conspicuous of its tribe. It is not uncommon in the State of Maine, ranging northward from Bangor through Nova Scotia, thence westward to Ottawa and the Hudson Bay country. Expanse 1.80–2.10 inches.

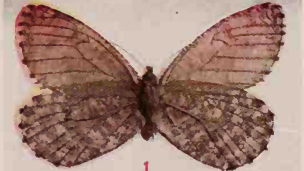
(2) *Œneis semidea* (Say), Plate LXXV, Fig. 1, ♀ (The White Mountain Butterfly).

The wings are very thin and semi-translucent. Restricted to he summit of Mount Washington, New Hampshire, and some of the alpine peaks in the Rocky Mountains. It is also found n Labrador, and no doubt in corresponding latitudes about Hudson Bay and westward. Expanse 1.75 inch.

(3) *Œneis katahdin* Newcomb, Plate LXXV, Fig. 2, ♂ The Katahdin Butterfly).

Closely allied to the preceding species, from which it may be distinguished by its paler wings and the irregular dark

PL. LXXV



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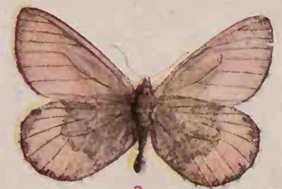

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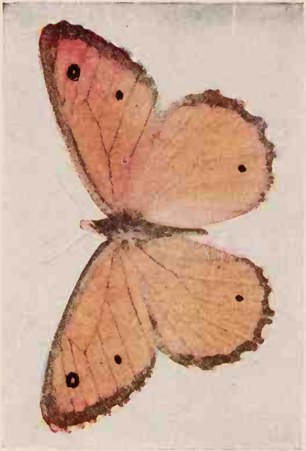
PL. LXXVI



band on the under side of the hind wings about their middle. Expanse 1.75 inch.

This insect in recent years has been found to inhabit the summit of Mount Katahdin in Maine.

(4) *Œneis macouni* (Edwards), Plate LXXVI, ♂, *Type* (Macoun's Arctic).

More like *O. jutta* in the form of the wings, but differs in coloration. It belongs to a group of species included in this genus, most of which are found in the region of the Rocky Mountains, which are larger and yellower on the upper side of the wings than the two preceding species. Expanse 2.00–2.25 inches.

Not uncommon about Lake Nipigon, north of Lake Superior.

SUBFAMILY LIBYTHEINÆ (THE SNOUT–BUTTERFLIES)

These insects may readily be distinguished from all others by their long projecting palpi, and by the fact that the males have only four feet adapted to walking while the females have six, a fact which seems to ally them to the *Erycinidæ*. On the other hand, the chrysalis is pendent as in the *Nymphalidæ*. There is but one genus of the group represented in our faunal region

GENUS LIBYTHEA FABRICIUS (THE SNOUT-BUTTERFLIES)

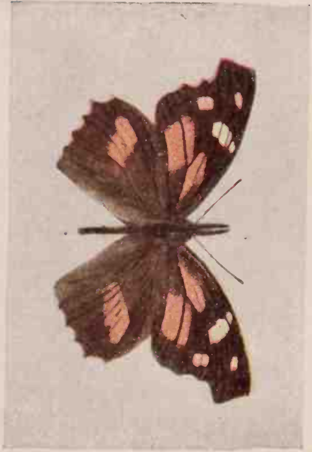
Small *butterflies*, the palpi enormously produced in comparison with other butterflies. The fore wings are strongly excavated on the outer margin, and produced at the end of the lower radial. The hind wing is upwardly lobed at the base, excised before the outer angle, and the outer margin is somewhat scalloped. The *egg* is ovoid, nearly twice as high as wide, ribbed, every other rib being higher than the one beside it and increasing in height toward the top. The *caterpillar* has a small head, overarched by the anterior swollen segments; it lives upon the hackberry (*Celtis*). The *chrysalis* has the abdomen conical, the head pointed, with two raised ridges running from the head on either side to the middle of the first segment of the abdomen; between these ridges is a low tubercle.

There are numerous species found in all parts of the world. but only three occur within our limits. Of these we figure the one which is most widely distributed.

(1) *Libythea bachmani* Kirtland, Plate LXXVII, ♂ (The Common Snout-butterfly).

The figure we give will enable the student to immediately recognize the insect.

PL. LXXVII



It ranges from New England and Ontario southward and westward over the whole country as far as Arizona and northern Mexico.

FAMILY ERYCINIDÆ (THE METAL-MARKS)

This is a great family of small or rather less than medium-sized butterflies, which is found in both the eastern and western hemispheres, but is mostly confined to the American tropics, where there are known to be about a thousand species, some of them remarkably beautiful in their colors and markings. The males have the fore legs aborted as in the case of the *Nymphalidæ*, while the females have six legs for walking. In this respect they resemble the *Lycænidæ*. The chrysalids are not pendent as are those of all the insects which we have hitherto described in this book, but are held in place by a silken girdle, and are closely appressed to the supporting surface. The strongest mark of distinction from other butterflies is the fact that the precostal vein of the hind wing is located on the extreme inner margin of the wing and sends out a little free hook, very much as is the case in many of the moths. The antennæ are very long and slender, distinctly knobbed at the end. Many genera have the peculiarity when alighting of not folding their wings, but carrying them flat, and they have also the habit of hiding under leaves, like moths. Most of the species found in our region occur in the Southwestern States, two alone are found in the Eastern States.

GENUS CHARIS HÜBNER (THE METAL-MARKS)

There are nearly fifty species of this genus found in the American tropics. There are but two species in the eastern parts of the United States, and two others in California. The figures we give will enable any one to tell apart the two species found in the Atlantic region.

(1) *Charis cænius* (Linnæus), Plate LXXVIII, Fig. 3, ♂ (The Little Metal-mark).

Very small, brighter red on the under side than on upper. Wings both above and below spotted with small steely-blue metallic markings. Common in Florida, ranging northward to Virginia and westward to Texas. Expanse 0.75 inch.

(2) *Charis borealis* (Grote & Robinson), Plate LXXVIII, Fig. 4, ♂ (The Northern Metal-mark).

Larger than the preceding species. Upper side sooty brown marked with blacker spots and a marginal and submarginal row of coppery red spots. On the under side the wings are light red with a multitude of small black spots arranged in transverse rows. The metallic spots of the upper side reappear below. Expanse 1.15 inch.

Range from New York to Illinois and Michigan and south to the Carolinas. Rare.

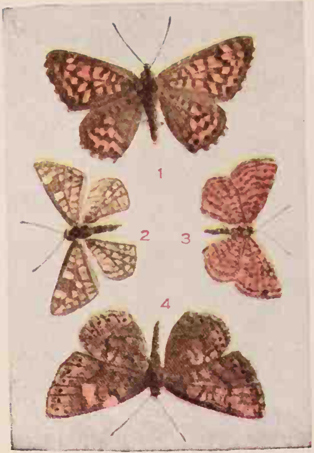
GENUS APODEMIA FELDER (THE MORMONS)

There are about ten species of this genus confined mainly to the Southwestern States and northern Mexico. Some, like the one we figure, are quite small, others are larger, spreading as much as 1.50 inch. They are rather gayly colored, usually with the wings on the upper side checkered or spotted with red, black, and white, and lighter on the under side. None of them have metallic markings on either side.

(1) *Apodemia palmeri* (Edwards), Plate LXXVIII, Fig. 2, ♂ (Palmer's Mormon).

One of the smallest species of the genus, mouse-gray, spotted with white above; on the un-

PL. LXXVIII



der side whitish gray, laved with pale red at the base of the fore wings, the spots of the upper side reappearing on this side. Expanse 0.75–0.95 inch.

Ranges from Utah to Mexico.

GENUS POLYSTIGMA SALVIN & GODMAN

There is thus far but one species known to belong to this genus, which is marked off from all others by the fact that the males have normally developed fore legs as well as the females, and thus are the "exception" in the family, "which proves the rule."

(1) *Polystigma nais* (Edwards), Plate LXXVIII, Fig. 1, ♂, *Type* (The Many-spot).

The lower side of the wings is pale red mottled with buff on the hind wings; the marks of the upper side reappear below and stand out boldly upon the paler ground. Expanse 1.00–1.25 inch.

P. nais occurs from Colorado to Mexico, east of the Rocky Mountains.

FAMILY LYCÆNIDÆ (THE HAIR-STREAKS, COPPERS, AND BLUES)

Small *butterflies*. The males have the first pair of legs more or less aborted, and not adapted to walking. Many of the genera are brilliantly blue on the upper side of the wings, others are coppery red. In Africa there are numerous genera which mimic other butterflies in the form and color of their wings. The *eggs* are turban-shaped adorned with ridges, minute eminences, and networks of raised lines. Under the microscope some of them look like sea-urchins after the spines have fallen off. The *caterpillars* are slug-shaped, flat; and while most of them feed on vegetable matter a few feed on scale-insects and aphids, and some on the larvæ of ants. The latter are African and Oriental forms. The *chrysalids* are attached to the place where the caterpillar has pupated by a cincture or girdle.

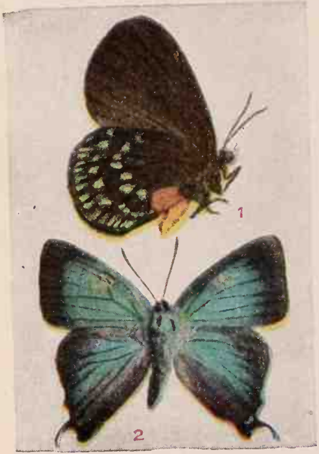
The family is very large and is represented in all parts of the world, but there are probably more species in the American tropics than in any other quarter of the globe, unless it be in the Malaysian Archipelago and New Guinea, from which a host of species have been described in recent years.

A multitude of refinements in classification have been invented by recent authors and a lot of generic names have been proposed which in this book we shall in part ignore, as they are based upon such slight points that nobody but a man armed with a big microscope can make them out. They puzzle common people, and this book is for laymen and not for the supertechnical.

GENUS EUMÆUS HÜBNER (THE BLUE-SPOTS)

Medium-sized or small. Dark in color, with the borders on the upper and lower sides and the hind wings below beautifully adorned with spots of metallic blue or green. There are three

PL. LXXIX



species in the genus, two of which occur in our territory, *E. atala*, which we figure, and *E. minyas*, which may be distinguished from the former by its larger size.

(1) *Eumæus atala* (Poey), Plate LXXIX, Fig. 1, ♂, *under side* (The Florida Blue-spot).

The figure accurately represents the lower side of this charming insect. Expanse 1.65–1.75 inch.

It is common in southern Florida and Cuba. The other species, *E. minyas*, which is much larger and equally beautifully marked, is found in southern Texas and thence ranges southward into Brazil.

Genus THECLA Fabricius (The Hair-streaks)

Mostly small *butterflies*. On the upper side very often colored with iridescent blue, green, or purple, sometimes reddish or dark brown; on the under side marked with lines and spots variously arranged and often very strikingly colored. What has been said as to the *eggs*, *larvæ*, and *chrysalids* of the family apply as well to this as to many of the following genera, and need not be here repeated.

While students of this group have subdivided extensively, and with scientific propriety have erected a number of genera which are acceptable to specialists, there seems to the writer no need for going into these things in this book, as most of the distinctions drawn are too fine to be appreciated by any but specialists.

(1) *Thecla halesus* (Cramer), Plate LXXIX, ♂ (The Great Purple Hair-streak).

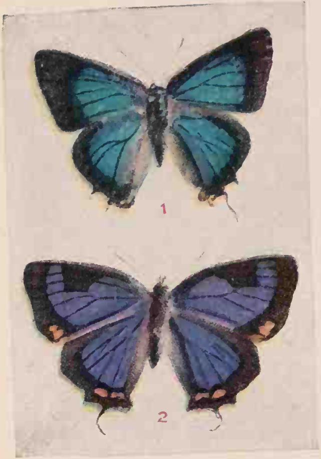
The upper side is deep purplish blue, as shown in our figure; on the lower side the thorax is black spotted with white, the abdomen orange-red; the wings warm sepia spotted with crimson at their bases, in the males glossed with a stripe of metallic green on the fore wings, and in both sexes adorned at the anal angle by spots of metallic green, red, and iridescent blue. Expanse 1.35–1.50 inch.

Common in Central America and Mexico, ranging north through the hotter parts of the Gulf States, and has been recorded from southern Illinois. Occurs in southern California and Arizona. The larva feeds on mistletoe.

(2) *Thecla m-album* Boisduval & Leconte, Plate LXXX, Fig. 1, ♂ (The White-M Hair-streak).

Smaller than the preceding species, bluer, and not inclined to greenish at base of wings on upper side; on under side fore wing crossed by a submarginal and a median line of white, contin-

PL. LXXX



ued on the hind wings, zigzagged at anal angle so as to look like an inverted M; near this is a rounded crimson patch; anal angle black glossed with blue. Expanse 1.35–1.45 inch.

Ranges from New Jersey and Wisconsin to Venezuela.

(3) *Thecla crysalus* Edwards, Plate LXXX, Fig. 2, ♂ (The Colorado Hair-streak).

Upper side as in our figure, under side marked with white lines edged with brown. Orange spots of upper side reappear below, but at anal angle are transformed into red eye-spots pupilled with black and margined with metallic green. Expanse 1.50 inch.

Ranges from Colorado to eastern Arizona.

(4) *Thecla favonius* Smith & Abbot, Plate LXXXI, Fig. 1, ♂ (The Southern Hair-streak).

On the under side the wings are marked much as in *T. m-album*, but in the region of the median nervules is a rather broad transverse carmine streak inwardly edged with dark lines. Expanse 1.00–1.15 inch.

Found in the Gulf States and as far north as South Carolina.

(5) *Thecla wittfeldi* Edwards, Plate LXXXI, Fig. 2, ♀, *Type* (Wittfeld's Hair-streak).

On the lower side both wings are crossed beyond the middle by two parallel pale lines bordered with darker tints, and at the end of the cells have each a short whitish bar. The anal angle is adorned with blue scales, before which is a red eye-spot of large size, externally marked with black. Expanse 1.25–1.35 inch.

Found in the region of Indian River, Florida.

(6) *Thecla autolycus* Edwards, Plate LXXXII, Fig. 1, ♂ (The Texas Hair-streak).

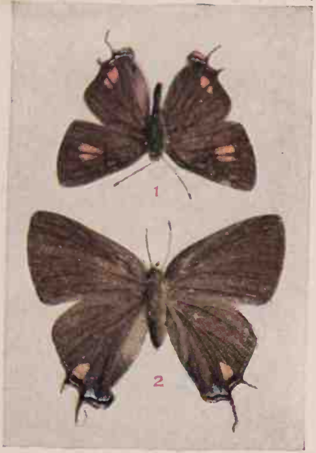
The carmine spots on the under side of the wings are not arranged across the median nervules as in *T. favonius*, but are located in the vicinity of the anal angle crowning the black crescents near the inner end of the outer margin. Expanse 1.15-1.30 inch.

Ranges from Missouri and Kansas to Texas.

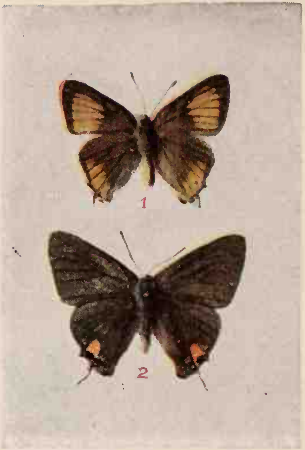
(7) *Thecla melinus* Hübner, Plate LXXXII, Fig. 2, ♀ (The Common Hair-streak).

This common little butterfly may easily be recognized by its its plain slaty upper surface, marked by a large black spot

PL. LXXXI



PL. LXXXII



crowned with crimson between the origin of the two tails on the hind wings. Expanse 1.10–1.20 inch.

The caterpillar feeds on hop vines. The insect is found throughout temperate North America, thence southward into Mexico and Central America on the highlands.

(8) *Thecla grunus* Boisduval, Plate LXXXIII, Fig. 1, ♂ (Boisduval's Hair-streak).

Wings on the upper side are as shown in our figure, but tawnier. On the under side the wings are pale tawny with transverse marginal and submarginal rows of small dark spots on both wings. Two or three of the marginal spots near the anal angle are conspicuously black crowned with a metallic green crescent. Expanse 1.10–1.20 inch.

The larva feeds upon the leaves of the live-oak (*Quercus chrysolepis*). Found in California and Nevada.

(9) *Thecla edwardsi* Saunders, Plate LXXXIII, Fig. 2, ♂ *under side* (Edwards' Hair-streak).

Our figure shows the under side; on the upper side the wings are dark brown glossed with plumbeous, with a pale sex-mark on the fore wing of the male near the costa. Expanse 1.15 inch.

The caterpillar feeds upon the young leaves of various kinds of oak. The species ranges from Quebec westward to Colorado and is not uncommon in New England, New York, and western Pennsylvania.

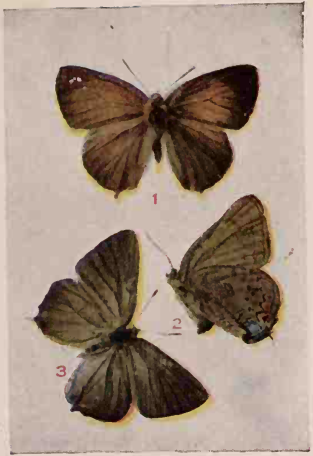
(10) *Thecla acadica* Edwards, Plate LXXXIII, Fig. 3, ♂ (The Acadian Hair-streak).

The wings on the under side are pale wood-brown, with a black bar at the end of the cells, and submarginal and median bands of small black spots surrounded with white; on the hind wings there is a submarginal row of red crescents, growing smaller from the anal angle toward the outer angle. Near the anal angle are two conspicuous black spots separated by a broad patch of bluish green scales. Expanse 1.15–1.25 inch.

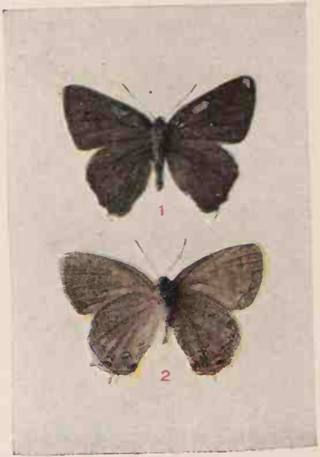
The caterpillar feeds upon willows. The insect ranges from Quebec to Vancouver Island.

(11) *Thecla calanus* Hübner, Plate LXXXIV, Fig. 1, ♂ (The Banded Hair-streak).

PL. LXXXIII



PL. LXXXIV



On the upper side resembling *T. edwardsi*, but warmer brown in color; on the under side wings are marked by fine white lines on the outer half, which are not broken as in *T. edwardsi*, but form continuous bands. Expanse 1.15 inch.

The larva feeds on oaks. The insect ranges from Quebec to Colorado and Texas, and is common in western Pennsylvania.

(12) *Thecla liparops* Boisduval & Leconte, Plate LXXXIV, Fig. 2, ♀, *under side* (The Striped Hair-streak).

Dark brown on the upper side. On the under side the lines are arranged much as in *T. edwardsi*, but farther apart, quite narrow, and scarcely defining the darker bands between them. The spots at the anal angle are obscure and blackish. Expanse 1.15 inch.

The larva feeds on oaks, willows. wild plum, and many other plants. The insect ranges from Quebec through the northern Atlantic States as far west as Montana and Colorado, but is never common.

(13) *Thecla damon* (Cramer), Plate LXXXV, Fig. 2, ♂, *under side;* var. *discoidalis* Skinner, Plate LXXXV, Fig. 1, ♂. *upper side* (Olive Hair-streak).

In our plate we have given in Fig. 1 a representation of the upper side of the form called *discoidalis*, which in the central part of the fore wing is broadly marked with reddish fulvous. In Fig. 2 we have a representation of the under side of typical *T. damon*. With the help of these figures the student may recognize both forms of the species.

The caterpillar feeds on the red cedar (*Juniperus virginiana*). It is double-brooded in the North and triple-brooded in the South. The species ranges from Ontario to Texas over the whole eastern half of the United States.

(14) *Thecla simæthis* (Drury), Plate LXXXV, Fig. 3, ♂ *under side* (The Brown-margined Hair-streak).

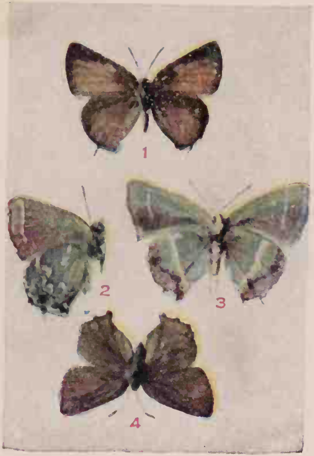
Closely resembling in many respects the preceding species, especially on the upper side, but the white band on the hind wings is straight and the outer margins are heavily marked with bright reddish brown. Expanse 0.85–1.00 inch.

This pretty species ranges from Texas well into South America.

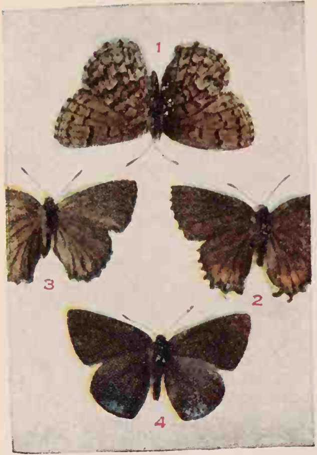
(15) *Thecla augustus* Kirby, Plate LXXXV, Fig. 4, ♀ (The Brown Elfin).

Brown above, paler below. The fore wings on the lower

PL. LXXXV



PL. LXXXVI



side are marked by a straight incomplete median band; the hind wings by an irregular curved median band. Back of these lines toward the base both wings are darker brown. Expanse 0.90 inch.

The insect is found in New England, thence northward and westward into the British possessions.

(16) *Thecla niphon* (Hübner), Plate LXXXVI, Fig. 1, ♀, *under side* (The Banded Elfin).

Our cut gives an excellent idea of the markings of the under side. On the upper side the insect is plain reddish brown. Expanse 1.10 inch.

The caterpillars feed upon pines. The insect ranges from Nova Scotia to Colorado in the Northern States, and is only found in pine woods, but is never very abundant.

(17) *Thecla irus* (Godart), Plate LXXXVI, Fig. 2, ♂ (The Hoary Elfin).

Grayish brown on the upper side, on the under side of the same color, but paler on the outer margins and darker toward the base; small crescents appear on the outer margins of the hind wings below, or they may be absent. Expanse 1.10 inch.

The larva feeds on young wild plums just after the petals of the flower have dropped away. The species ranges from the Atlantic to the Pacific in the latitude of New England.

(18) *Thecla henrici* Grote & Robinson, Plate LXXXVI, Fig. 3, ♀ (Henry's Hair-streak).

Very much like the preceding species, but with the outer half of the wings laved with reddish brown. The hind wings on the under side are blackish brown; on the basal half of the outer margin paler, the division between the dark and light shades being irregular and sharply defined. Expanse 1.00–1.10 inch.

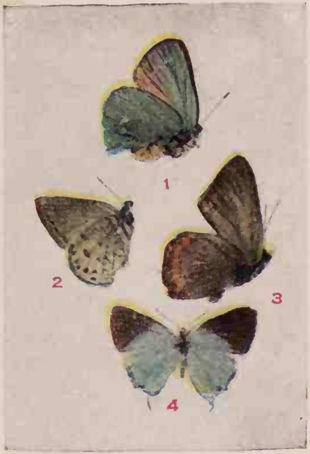
This species, like the preceding, feeds on young plums. It ranges from Maine to West Virginia, and is not very common.

(19) *Thecla læta* Edwards, Plate LXXXVI, Fig. 4, ♂ (Early Hair-streak).

Wings brown glossed with bright blue on the upper side; on the under side pale fawn, with a band of pale red spots on both wings about the middle, and a few similar spots on the outer and inner margins of the hind wings. Expanse 0.75–0.85 inch.

The species ranges from Quebec to southern New Jersey and westward and southward to West Virginia and Arizona. It is a rare species, and appears in the early spring.

PL. LXXXVII



(20) *Thecla dumetorum* Boisduval, Plate LXXXVII, Fig. 1, ♂, *under side* (The Green White-spotted Hair-streak).

Dark fawn above; on the outer third of the wings often shaded with reddish; on the under side both wings are green, the fore wings with a short band of white spots on the outer third; the hind wings with a white spot on the costa beyond the middle and two or three conspicuous white spots near the anal angle. Expanse 1.10 inch.

The eggs are laid on the buds of *Hosackia argophylla.* The insect ranges from Oregon and California eastward as far as Colorado.

(21) *Thecla behri* Edwards, Plate LXXXVII, Fig. 2, ♂, *under side* (Behr's Hair-streak).

On the upper side the wings are broadly reddish fulvous on the disk, with the costa and outer margins of both wings broadly dark brown or black. The under side is accurately shown in our cut, and therefore needs no description. Expanse 1.10 inch.

This species is also found in Oregon and California, and ranges as far east as Colorado.

(22) *Thecla titus* (Fabricius), Plate LXXXVII, Fig. 3, ♂, *under side* (The Coral Hair-streak).

On the upper side uniformly gray-brown, although occasionally specimens of the female sex have a few red spots on the hind wing at the anal angle. On the under side the hind wings have a conspicuous submarginal band of coral-red spots, as shown in our cut. Expanse 1.30 inch.

The caterpillar feeds on the leaves of the wild cherry and wild plum. The insect ranges from the Atlantic to the Rocky Mountains and from Maine to the latitude of northern Georgia.

(23) *Thecla clytie* Edwards, Plate LXXXVII, Fig. 4, ♂ (Clytie).

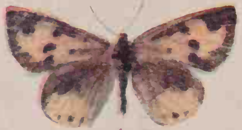
The upper side of this pretty little insect is well delineated in our figure. On the lower side the wings are white, with the usual marginal and transverse markings quite small and faint. Expanse .90 inch. The species occurs in Texas, Arizona, and northern Mexico.

GENUS FENISECA GROTE (THE HARVESTER)

Small, bright orange-yellow on the upper side, the costal and outer margin of the fore wings and the basal half of the hind wings dark brown. On the under side more or less mottled with gray and brown, the markings of the upper side reappearing. *Egg* sub-globular, much wider than high, marked with a multitude of fine and indistinct raised ridges disposed in the form of polygonal cells. *Caterpillar* slug-shaped, covered with bristling spines, upon which it gathers the scales of the mealy bugs upon which it feeds. *Chrysalis* brown in color, showing a remarkable likeness to the face of a monkey, a phenomenon which also appears in the case of its allies of the genus *Spalgis* found in Africa and Asia, as the writer has pointed out.

Only one species of the genus is known.

PL. LXXXVIII



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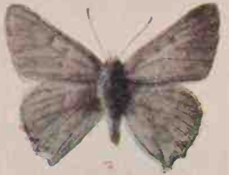
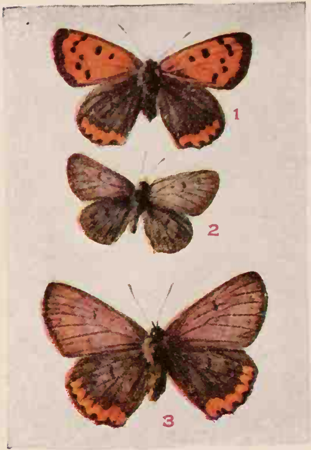


PL. LXXXIX



(1) *Feniseca tarquinius* (Fabricius), Plate LXXXVIII, Fig. 1, ♂ (The Harvester).

There is considerable variation in the size of the dark markings on the upper side of the wings, and in some specimens they almost entirely disappear. Expanse 1.30 inch. Ranges from Nova Scotia to the Carolinas, and through Mississippi valley.

GENUS CHRYSOPHANUS DOUBLEDAY (THE COPPERS).

Small *butterflies* with the upper side of the wings some shade of coppery red or orange, often glossed with deep purple. On the under side the wings are marked with a multitude of spots and lines. *Egg* hemispherical, flattened on the base, pitted above with polygonal or circular depressions. *Larva* slug-shaped, thickest in the middle and tapering either way, head very small. *Chrysalid* rounded at either end, and supported by a silken girdle a little forward of the middle.

The genus is found in both hemispheres. There are over a dozen species in the United States, five of which we have selected for illustration.

(1) *Chrysophanus xanthoides* (Boisduval), Plate LXXXVIII, Fig. 2, ♂ (The Great Copper).

This is the largest species of the genus in America. On the under side the wings are creamy white, and the spots of the upper side reappear as black markings, which show forth very distinctly on the lighter ground. Expanse 1.50–1.65 inch.

The species is confined to the western half of the continent.

(2) *Chrysophanus hypophlæas* (Boisduval), Plate LXXXIX, Fig. 1, ♀ (The American Copper).

This is one of the commonest butterflies in the United States. Everybody has seen it flitting about upon lawns and in gardens. The figure we give is unmistakable. Expanse 1.00 inch.

The caterpillar feeds upon common sorrel (*Rumex acetosella*). The insect ranges from Hudson Bay to the Gulf States, but does not invade the hot belt about the Gulf.

(3) *Chrysophanus epixanthe* (Boisduval & Leconte), Plate LXXXIX, Fig. 2, ♂ (The Least Copper).

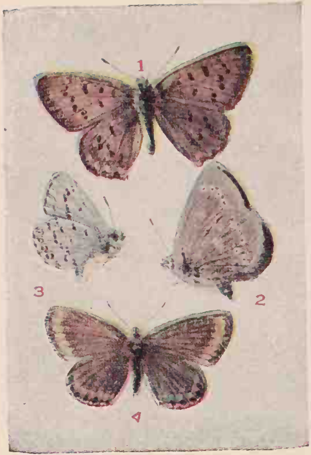
The smallest species in the genus, confined to the north. The male above has the wings fuscous, shot with violet, with a few red spots near the anal angle of the hind wings. The female is pale gray above, more profusely marked with dark spots than the male. Below the wings are pale gray sprinkled with bluish scales at the base, marked as above. Expanse 0.85–0.95 inch.

Common from Newfoundland to British Columbia, never south of New England.

(4) *Chrysophanus thoë* (Boisduval & Leconte), Plate LXXXIX, Fig, 3, ♂ (The Bronze Copper).

The female differs from the male in having the fore wings bright coppery red, marked with a number of dark spots, three in the cell, one below it, and an irregular transverse band

PL. XC



of them crossing the limbal area. The outer margin is heavily banded with fuscous. Below the fore wing is tawny red in both sexes, pale gray at the apex; the hind wings are bluish gray with a broad band of carmine on the outer margin. Both wings underneath profusely adorned with small black spots. Expanse 1.30–1.40 inch.

Ranges from Maine to Colorado, southward to northern Virginia.

(5) *Chrysophanus helloides* (Boisduval), Plate XC, Fig. 1, ♂ (The Purplish Copper).

The male has the wings on the upper side broadly shot with iridescent purple; the female, which is larger than the male, has the wings red, with less iridescence. Below the fore wings in both sexes are pale red, the hind wings reddish gray with a marginal row of brick-red crescents. Expanse 1.15–1.30 inch.

Ranges from northern Illinois to British Columbia.

GENUS LYCÆNA FABRICIUS (THE BLUES)

The *butterflies* in this group are generally small, with the upper side of some shade of pale blue. On the under side the wings are paler in color, variously marked with spots and lines. The genus in recent years has been subdivided into smaller subgenera but as an ability to discriminate these involves a knowledge of minuter anatomical details, which is only possessed by specialists, the writer has not deemed it worth the while in a little manual like this to go deeply into these matters. The old name *Lycæna*, which has been in vogue for a century, and which is still applied to part of the group, is sufficiently characteristic. If we were reviewing all the species of the world, of which there are many hundreds in this assemblage of forms, we would be forced to use the minuter methods of classification. The *eggs* are turban-shaped; the *caterpillars* are slug-shaped, feeding on the petals and bracts of flowers or tender terminal leaves; the *chrysalids* are short, rounded at either end, supported by a silken girdle and closely appressed to the supporting surface.

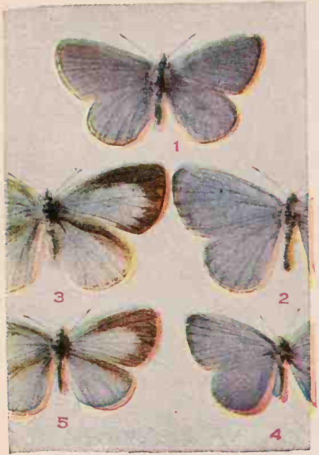
(1) *Lycæna couperi* Grote, Plate XC, Fig. 2, ♂, *under side* (Couper's Blue).

On the upper side the wings of the male are pale shining blue with a narrow black border; of the female darker blue broadly margined with dusky. On the under side in both sexes the wings are brownish gray relieved with white spots, having dark pupils. Expanse 1.25 inch. It is a boreal form.

(2) *Lycæna aster* Edwards, Plate XC, Fig. 3, ♂, *under side* (The Aster Blue).

On the upper side the male is pale lilac-blue, the female darker blue, with a submarginal row of paler blue spots on the margin of the hind wing. On the under side the fore wings have a dark bar at the end of the cell followed on the limbal area with a curved band of small dark spots. This style of decoration is repeated on the hind wings, and in addition there is a marginal band of pale yellow oval spots, each surrounded by a fine black encircling line. Expanse 0.95–1.00 inch. The insect is known thus far only from Newfoundland.

PL. XCI



(3) *Lycæna melissa* Edwards, Plate XC, Fig. 4, ♀ (The Orange-margined Blue).

The male on the upper side is pale blue, with a narrow black marginal line and white fringes. The female is brown or lilac-gray with a series of orange-red crescents on the outer margin of both wings. The wings below are stone-gray with the usual spots, but on the hind wings the orange crescents are oblong tipped inwardly with black and outwardly with metallic green. Expanse 0.90-1.15 inch.

Ranges from Arizona to Montana.

(4) *Lycæna scudderi* Edwards, Plate XCI, Fig. 1, ♂ (Scudder's Blue).

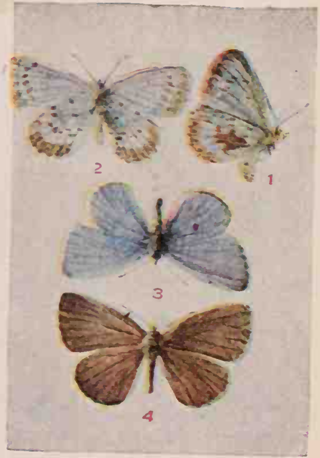
Our figure gives a good idea of the upper side of the male, which is hard to discriminate from the same sex of *L. melissa*. The female is darker, and has only a few orange crescents on the outer margin of the hind wing on the upper side. On the under side the wings are shining white, the spots much reduced in size, the large orange spots found in *L. melissa* being replaced by little ochreous spots very obscurely tipped externally by a few greenish scales.

The caterpillar feeds on lupine and allied plants. The insect is very common in the basin of the St. Lawrence River and the Great Lakes. It abounds in central New York.

(5) *Lycæna pseudargiolus* (Boisduval & Leconte), Plate XCI, Fig. 2, ♂; Fig. 3, ♀. Form *neglecta* Edwards, Plate XCI, Fig. 4, ♂; Fig. 5, ♀. Form *lucia* Kirby, Plate XCII, Fig. 1, ♂, *under side.* Form *marginata* Edwards, Plate XCII, Fig. 2, ♂, *under side;* Fig. 3, ♂ *upper side.* Form *nigra* Edwards, Plate XCII, Fig. 4, ♀ (The Common Blue).

This insect which is very common and may be found upon the wing from early spring until late in the autumn illustrates in a remarkable manner the phenomenon of polymorphism; that is to say, it has a number of forms, some of which are seasonal, some of which are sexual, some of which are climatic. It is in fact only through the labors of the late William Henry Edwards that some of the mysteries were cleared up, he having by breeding established the fact that some of the so-called species could be raised from eggs derived from one common stock. The great series of specimens upon which his conclusions were founded are in the possession of the writer, and have from time to time been supplemented by a vast amount of other material all of which confirms his teachings.

PL. XCII



The forms *lucia* and *marginata* are winter forms, coming from chrysalids which have endured the long cold of the winter months and are the first to appear in spring. They are the only forms which occur in the far north near the Arctic Circle.

The forms *pseudargiolus* and *neglecta* are summer forms of the second and third generations, produced from eggs laid by *lucia* and *marginata*. *Nigra* is a dimorphic female form belonging to the summer broods and is melanic; that is to say, it is a form in which dark color prevails. Students of biology recognize a tendency in some animals to become black, while there is also a tendency to become white, or to produce albinoes. These tendencies in opposite directions in color are often observed in butterflies, and the melanic female of the species under consideration illustrates it. There is still another form, *piasus*, which occurs in Arizona and Mexico, and is climatic, or due to the influence of environment.

The winter forms are dwarfed and darkly marked on the under side as our figures show; the summer forms are larger, pale on the under side and dark on the outer borders above.

The species has a range in the expanse of wing of from 0.85–1.25 inch.

It occurs from Alaska to Florida, and from Anticosti to northern Mexico.

(6) *Lycæna amyntula* Boisduval, Plate XCIII, Fig. 1, ♂; Fig. 2, ♀ (The Western Tailed Blue).

Male pale blue on upper side; female darker, the hind wings with a submarginal row of orange crescents pupilled with black. Expanse 1.00–1.25 inch.

Ranges from the Rocky Mountains to the Pacific in British America and southward as far as Colorado.

(7) *Lycæna comyntas* (Godart), Plate XCIII, Fig. 3, ♂; Fig. 4, ♀ (The Eastern Tailed Blue).

Somewhat closely resembling the preceding, but appreciably smaller. Expanse 1.00–1.10 inch.

Ranges from the Saskatchewan to Costa Rica, and from the Atlantic to the Rocky Mountains.

(8) *Lycæna isophthalma* Herrich-Schäffer, Plate XCIII, Fig. 5, ♀ (The Dwarf Blue).

Light brown above in both sexes, with a row of dark spots on outer margin of hind wings; below pale brown profusely marked by light spots and bands, the dark marginal spots of the upper side reappearing, and defined by circlets of metallic scales. Expanse 0.75 inch.

Found in the Gulf States and the Antilles.

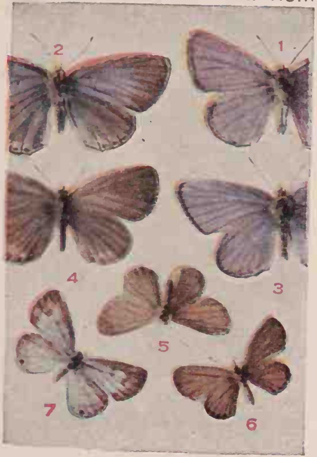
(9) *Lycæna exilis* Boisduval, Plate XCIII, Fig. 6, ♂ (The Pygmy Blue).

The smallest of North American butterflies, closely resembling the foregoing, but distinguished by the white spot on fringe near inner angle of fore wing, and the white fringes of the same wing near apex. Expanse 0.65 inch.

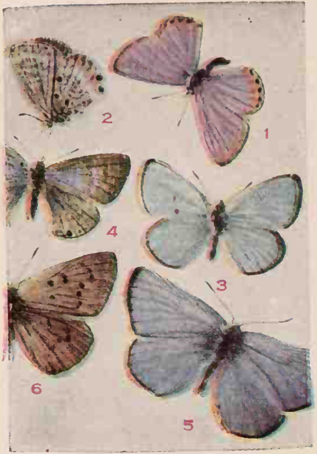
The Pygmy occurs in the Gulf States and in tropical America.

(10) *Lycæna theona* Lucas, Plate XCIII, Fig. 7, ♀ (The West Indian Blue).

PL. XCIII



PL. XCIV



Male shining lavender-blue; this color also glosses the dark outer borders of the wings; female white, with outer borders heavily blackish; fore wings shot with shining sky-blue at base. Hind wings near anal angle have conspicuous eye-spots both above and below. Expanse 0.80 inch.

Occurs in the Gulf States and throughout the tropics of the New World.

(11) *Lycæna acmon* Doubleday & Hewitson, Plate XCIV, Fig. 1, ♂ (Red-margined Blue).

In many respects resembling *L. melissa*, but somewhat smaller. Male on upper side brighter blue, and female not as brown as *L. melissa*, though darker than the male, her wings broadly shot with violet-blue. In both sexes a broad deep red submarginal band on hind wings, marked with black spots. Expanse 0.85–1.10 inch.

Ranges from Arizona to Washington and Montana. The larva feeds on *Hosackia*.

(12) *Lycæna ammon* Lucas, Plate XCIV, Fig. 2, ♀, *under side* (The Indian River Blue).

Male brilliant lilac-blue on upper side; female violet-blue with wide black borders on fore wings, and one or two conspicuous eye-spots near anal angle of hind wings, each surmounted by a carmine crescent. Expanse 0.95–1.10 inch.

Not uncommon in southern Florida; abundant in the Antilles and tropical America.

(13) *Lycæna marina* Reakirt, Plate XCIV, Fig. 4, ♀ (The Marine Blue).

Male on upper side pale dusky lilac, the dark bands of the under side showing through on upper side. Female dark brown above, with wings at base shot with lilac-blue; the dark bands on the disk are prominent in this sex, especially on fore wings. Expanse 1.10 inch.

Occurs in Texas, Arizona, southern California, and southward. The larva feeds on alfalfa and allied plants.

(14) *Lycæna lygdamus* (Doubleday), Plate XCIV, Fig. 3, ♂ (The Silvery Blue).

The upper side is well shown in our illustration. The under side is pale chocolate-brown, having on both wings a submarginal band of black spots encircled with white, similar spots at the end of the cells, and one or two also on the costa of the hind wing. Expanse 0.85–1.00 inch.

Ranges from Michigan to Georgia.

(15) *Lycæna heteronea* Boisduval, Plate XCIV, Fig. 5, ♂; Fig. 6, ♀ (The Varied Blue).

The largest species of the genus. Male blue, female brown; the markings on upper side of latter recalling the female of the genus *Chrysophanus*. Expanse 1.25–1.40 inch. Below the wings are white marked with faint brown spots on the hind wings and more distinct spots on the fore wings.

Ranges from Colorado to California at suitable elevations among the mountains.

FAMILY PAPILIONIDÆ

(THE SWALLOW-TAILS AND ALLIES).

The *butterflies* of this group are provided in both sexes with six legs adapted to walking The internal vein of the hind wing is wanting, its place being taken by the submedian. *Caterpillars* elongate, and in the genus *Papilio* provided with *osmateria* or protrusive forking scent-organs, which, when excited, they thrust forth from the pouch back of the head in which they usually lie concealed. *Chrysalids* in all the genera more or less elongate, attached at anal extremity to a button of silk, and held in place by a silk girdle, but never closely appressed to the supporting surface as is the case in the *Erycinidæ* and *Lycænidæ*.

SUBFAMILY PIERINÆ

(THE YELLOWS, SULPHURS, AND WHITES).

For the most part small or medium-sized *butterflies*, white or yellow in color, with dark marginal markings. The *eggs* are spindle-shaped, marked with vertical ridges and horizontal cross-lines. The *caterpillars* are cylindrical, relatively long, generally green in color, with longitudinal stripes. The *chrysalids* are more or less pointed at the head, with the wing-cases greatly developed on the ventral side, forming a more or less keel-shaped projection upon this surface.

The subfamily is very large, and is well represented in the tropics of both the eastern and western hemispheres. Certain genera are also widely distributed in the colder regions of both the north and the south, among them the genus *Colias*, species of which occur from Greenland to Patagonia and from the North Cape to the Cape of Good Hope.

GENUS TACHYRIS WALLACE
(THE FLORIDA WHITE).

There are about seventy species in this genus, all of which are found in the Old World, except the one which occurs in our fauna, and which has a very wide range throughout the tropics of the New World.

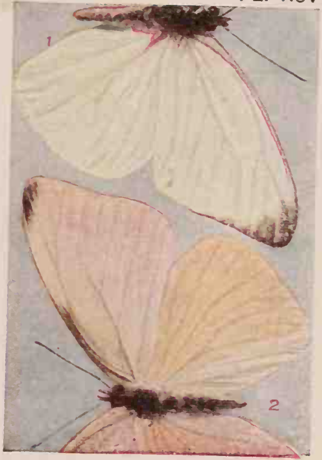
(1) *Tachyris ilaire* (Godart), Plate XCV, Fig. 1, ♂; Fig. 2, ♀. Our plate gives such an excellent reproduction of the upper side of the wings of this species that no formal description seems necessary. A melanic form of the female sometimes occurs in which the wings are almost wholly dull blackish on both sides. Normally the under side of the wings in the female is pearly white marked with bright orange at base of fore wings. Expanse 2.50–2.75 inches.

Occurs in southern Florida and throughout tropical America.

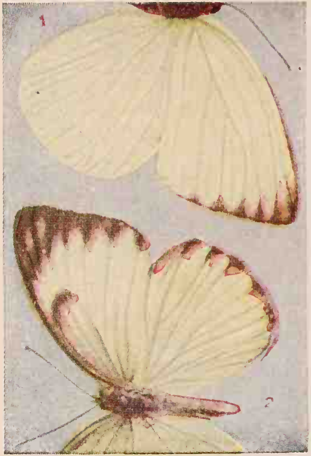
GENUS PIERIS SCHRANK
(THE WHITES).

Medium-sized *butterflies*, generally white in color, marked on both upper and under sides with darker lines and spots. Antennæ clubbed; palpi short, compressed, with the last joint

PL. XCV



PL. XCVI



short and pointed. *Eggs* spindle-shaped, with vertical raised ridges. *Caterpillar* elongate, head hemispherical, feeding upon cruciferous plants. *Chrysalis* attached by anal extremity and held in place by a silk girdle; concave on the ventral side, convex on the dorsal side, with a hump-like or keel-shaped eminence on the thorax. Head conical.

An extensive genus, confined principally to the northern hemisphere.

(1) *Pieris monuste* (Linnæus), Plate XCVI, Fig. 1, ♂; Fig. 2, ♀ (The Great Southern White).

Our figure gives a perfect idea of the upper side of the wings. Hind wing on under side grayish saffron, crossed by a poorly defined pale brown transverse band of spots, the veins pale brown, between them pale brown rays on the interspaces. Expanse 1.65–2.35 inches.

Has a wide range in tropical America. Common in the Gulf States.

(2) *Pieris protodice* Boisduval & Leconte, Plate XCVII. Fig. 1, ♂; Fig. 2, ♀ (The Common White).

Our illustration of both sexes obviates the necessity for a description. Expanse 1.90–2.15 inches.

Ranges from the Atlantic to the Rocky Mountains, and from southern Canada to the Gulf States.

(3) *Pieris napi* (Linnæus), variety *oleracea* (Harris), Plate XCVIII, Fig. 1, ♂; variety *pallida* Scudder, Plate XCVIII, Fig. 2, ♂; variety *bryoniæ* (Ochsenheimer), Plate XCVIII, Fig. 3, ♀ (The Mustard White). (See p. 174.)

Occurs throughout temperate and boreal North America, ranging well up to the Arctic Circle; also occurs in the eastern hemisphere, ranging from north Africa to the North Cape, and all over temperate and subarctic Asia. There are a multitude of forms which have been named and described; we give but three of those found in America. *Oleracea* is a winter form; *pallida* is the common form; and *bryoniæ* is a subarctic form found in Alaska, Siberia, and the Alps in Europe.

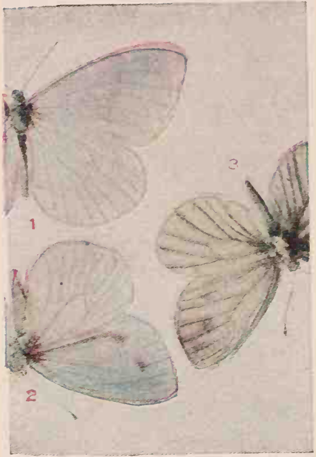
The species ranges from the Atlantic to the Pacific, and from Alaska to the northern boundaries of the Gulf States. Expanse 1.50–2.00 inches.

(4) *Pieris rapæ* (Linnæus), Plate XCIX, Fig. 1, ♂; Fig. 2, ♀ (The Cabbage Butterfly). (See p. 174.)

This excessively common insect has been in comparatively

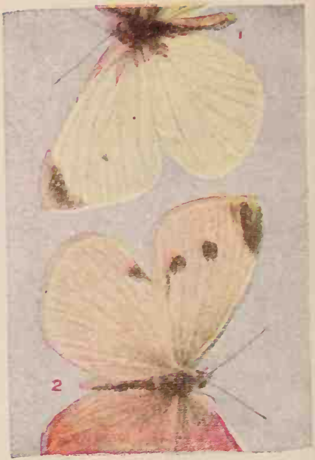
PL. XCVII

PL. XCVIII



recent years introduced from Europe. It first appeared about Quebec in 1860; since then it has come to occupy the continent, and wherever cabbages are grown hundreds of these butterflies may be seen. The loss to gardeners which it causes is estimated to run into millions of dollars annually. It feeds on all the *Cruciferæ*. The multiplication of *P. rapæ* has been followed by the partial extinction of our native Pierids just as our birds have disappeared before the English Sparrow. Expanse 2.00 inches.

PL. XCIX



GENUS NATHALIS BOISDUVAL

Small yellow butterflies margined with black. Fore wings somewhat narrow and produced; antennæ quite short; upper radial vein in fore wing wanting. There are three species found in the subtropical regions of the New World, one of which invades our territory.

(1) *Nathalis iole,* Boisduval Plate C, Fig. 1, ♂; Fig. 2, ♀ (The Dwarf Yellow).

This little species, of which we give excellent figures, cannot be mistaken. Expanse 1.00–1.25 inch.

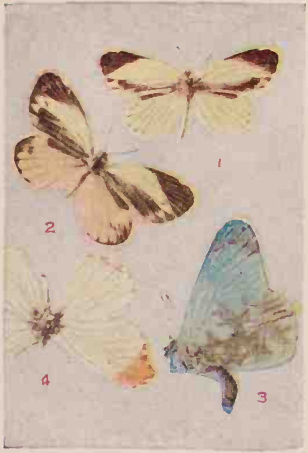
It ranges from southern Indiana and Illinois to Arizona, southern California, and northern Mexico. The larva feeds on *Erodium cicutarium* or pin-clover, and other *Geraniaceæ.*

GENUS EUCHLOË HÜBNER

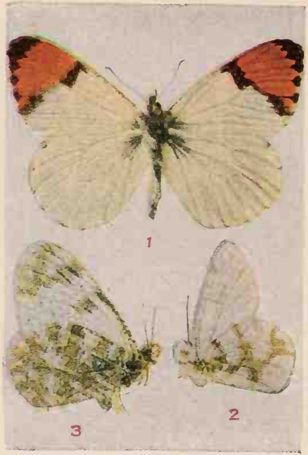
(THE ORANGE-TIPS AND MARBLE-WINGS).

Small *butterflies,* white in color, with the apex of the fore wings dark brown, marked with spots and bands of orange-yellow or crimson; on the under side the hind wings are generally more or less mottled with green spots and striæ. *Eggs*

PL. C



PL. CI



spindle-shaped; *caterpillar* relatively long, with small head; *chrysalis* with the head greatly produced, wing-cases compressed forming a keel-shaped projection.

(1) *Euchloë ausonides* (Lucas), Plate C, Fig. 3, ♂, *under side* (The Western Orange-tip).

On upper side wings at apex tipped with dark fuscous, and lack altogether the orange or red which is characteristic of most of the other species of the genus. On under side fore wings have a very pale greenish tint; hind wings marked with three irregular green bands, more or less broken up, forking in various directions. Expanse 1.65–1.90 inch.

Ranging from Arizona to Alaska and eastward to Colorado.

(2) *Euchloë genutia* (Fabricius). Plate C, Fig. 4, ♂ (The Falcate Orange-tip).

Readily recognized by the hooked tip of the fore wings. The female has no orange marking on the tip. Single-brooded in the Northern States, but double-brooded in the Carolinas. Expanse 1.30–1.50 inch. The caterpillar feeds on *Sisybrium*, *Arabis*, *Cardamine*, and other cruciferous plants.

Ranges from New England to Texas.

(3) *Euchloë sara* (Lucas) Plate CI, Fig. 1, ♂ (Lucas' Orange-tip).

There are numerous varieties of this beautiful insect. On the under side the hind wings are marked with irregular patches of greenish scales having a "mossy" appearance. Expanse 1.75 inch. Occurs in Pacific States.

(4) *Euchloë rosa* (Edwards), Plate CI, Fig. 2, ♂, *under side* (The Rosy Marble-wing).

Above pure white without any red at the tip of the primaries; a transapical black band, broken in the middle, and a small black bar closes the cell. Under side well shown in our figure except that there fails to appear a faint rosy tint in the hind wings which is characteristic of all specimens which we have examined. Expanse 1.35–1.40 inch. Found in Texas.

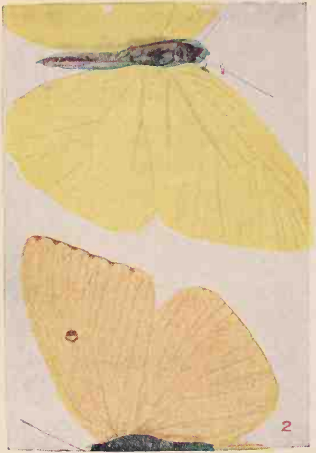
(5) *Euchloë hyantis* (Edwards), Plate CI, Fig. 3, ♀, *under side* (Edwards' Marble-wing).

This species also is without orange at the tip of the fore wings; the wings on the under side are as shown in our figure, heavily marbled on the hind wings with dark green bands and spots. Expanse 1.65–1.85 inch. *Habitat* California.

GENUS CATOPSILIA HÜBNER (THE GREAT SULPHURS)

Large *butterflies;* brilliant lemon-yellow or orange-yellow marked with a few darker spots and with a narrow band of brown, especially in the female, on the outer margin of the fore wings. Very quick in flight. *Eggs* spindle-shaped and acutely pointed, vertically ribbed. *Caterpillars* relatively long, head small, segments resembling beads strung together, surface covered with minute papillæ in transverse rows. *Chrysalis* concave dorsally, head conical, projecting, wing-cases compressed, forming a wide keel-shaped projection on ventral side.

PL. CII



The genus is mainly tropical; one species, however, ranges as far north as Long Island and western Pennsylvania.

(1) *Catopsilia eubule* (Linnæus), Plate CII, Fig. 1, ♂; Fig. 2, ♀ (The Cloudless Sulphur).

Well depicted in our plate and requiring no special description. Expanse 2.50 inches. The caterpillar feeds on leguminous plants, preferably the species of *Cassia*.

GENUS KRICOGONIA REAKIRT

Medium-sized butterflies, whitish or yellow on upper side, with some dark markings, especially in the male; fore wings somewhat falcate.

The genus is confined to the New World; one species occurs in our territory.

(1) *Kricogonia lyside* (Godart), form *terissa* (Lucas), Plate CIII, Fig. 1, ♂; Fig. 2, ♀ (Godart's Sulphur).

Our plate gives a very good idea of this insect in both sexes, the male being always marked near the outer angle of hind wings by a short black bar. Expanse 1.90–2.10 inches.

Found in southern Texas and Mexico.

There are a number of forms of this insect, slightly variant.

GENUS MEGANOSTOMA REAKIRT (THE DOG-FACE BUTTERFLIES)

Closely resembling the insects of the next genus, from which they may be distinguished by the more pointed fore wings, and the fact that the rude outlines of the head of a dog are shown in yellow silhouette upon the fore wings. There are two species in our territory, one of which, *M. eurydice* Boisduval, found in California, may be distinguished from the other by the splendid purplish iridescence of the fore wings of the male.

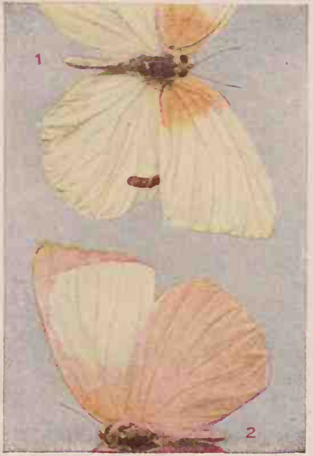
(1) *Meganostoma cæsonia* (Stoll), Plate CIV, ♂ (The Southern Dog-face). (See p. 180.)

The sexes are much alike in this species, which ranges from Florida and the Gulf States northward as far as southern Illinois. Expanse 2.25 inches.

GENUS COLIAS FABRICIUS (THE SULPHURS)

Medium-sized *butterflies*, yellow, orange, and sometimes white or greenish yellow with dark-bordered wings, the borders generally heaviest in the female. *Eggs* spindle-shaped, tapering at top and bottom, and attached to the surface where laid by a flat disk-like expansion; vertically and horizontally ribbed.

PL. CIII



PL. CIV

Caterpillars elongated; head small; body generally green, striped longitudinally. They feed upon leguminous plants, and especially upon the various species of clover (*Trifolium*) and *Astragalus*, though some boreal species are known to feed upon the foliage of huckleberries (*Vaccinium*) and willows.

The genus is large and is found on every continent except Australia. It is lacking in the very hot tropical regions of both the New and Old Worlds, but is found in Greenland and thence ranging south among the cordilleran uplifts to Patagonia. It is represented from Japan to Norway, and turns up at the Cape of Good Hope.

(1) *Colias philodice* Godart, Plate CV, Fig. 1, ♂; Fig. 2, *albino*, ♀ (The Common Sulphur).

This is the common "Puddle-butterfly" or "Clover-butterfly" which every child has seen gathered in swarms about moist places, or hovering by the score or hundreds over the blossoming clover fields. There are many variations both in size and color. The females are frequently albinoes, that is to say they are white, rather than yellow. Now and then melanic males turn up, but they are rare. In these the wings are black, of the same color as the borders in normal specimens Expanse 1.25–2.25 inches.

Ranges from Canada to Florida and westward to the Rocky Mountains.

(2) *Colias eurytheme* Boisduval, Plate CVI, Fig. 1, ♂; Plate CVII, ♀; form *keewaydin* Edwards, Plate CVI, Fig. 2, ♂ (The Orange Sulphur). (See pp. 182 and 183.)

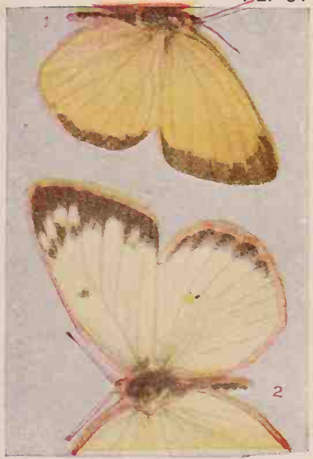
This is a form which is known to be very strongly polymorphic, having quite as many varieties and races as *Lycæna pseudargiolus*, for instance. *C. keewaydin* is a large winter form, which has the wings strongly washed with orange; there is a small winter form called *C. ariadne*, which is also laved with orange, though not so strongly. There is another form called *C. eriphyle*, which belongs to the summer brood, which has no orange on the wings, but is plain yellow; and there are still other forms. Expanse 1.60–2.15 inches.

The Orange Sulphur has a wide range, extending from the Atlantic to the Pacific, and from Canada to the northern portions of the Gulf States, though not invading the hotter parts of these states.

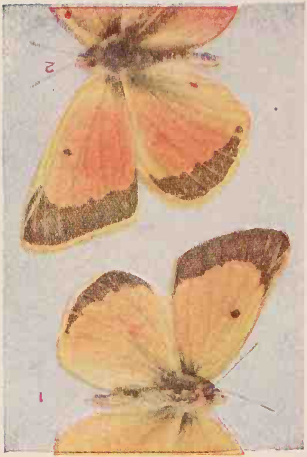
Genus TERIAS Swainson (The Yellows)

Small *butterflies*, generally some shade of orange or yellow, with wings more delicate in structure than most of the genera

PL. CV



PL. CVI



belonging to the *Pierinæ*. Both wings generally rounded, but in a few species produced at the apex of the fore wing and at the end of the second median nervule of the hind wing. *Eggs* spindle-shaped, much swollen at the middle. *Larva* cylindrical, with a very small head, and the three first segments larger than those after them giving the body a humped appearance in front. *Chrysalis* compressed laterally, with the wing-cases forming a deep keel on the ventral side, more pronounced than in any other American genus, except *Catopsilia*.

This is a very large genus represented by many species in the tropical and subtropical regions of both the eastern and western hemispheres. Many of the species are dimorphic or polymorphic, and there is a vast deal of confusion as to their classification.

(1) *Terias nicippe* (Cramer), Plate CVIII, Fig. 1, ♂; Fig. 2, ♀ (The Small Orange). (See Plate on p. 184.)

The species is subject to considerable variation. Rare in New England, but common south of latitude 40° as far as the Rocky Mountains; also reported from Southern California, where it is rare. Expanse 1.50–2.00 inches.

(2) *Terias mexicana* Boisduval, Plate CVIII, Fig. 3, ♂ (The Mexican Yellow). (See Plate on p. 184.)

Easily recognizable by our figure. Expanse 1.75–1.85 inch. Found in Texas and Arizona, thence southward.

(3) *Terias lisa* (Boisduval & Leconte), Plate CIX, Fig. 1, ♂ (The Little Sulphur). (See Plate on p. 184.)

Allied to the three following species, but may be told apart at once by the solid black outer borders of the wings and the absence of the black band on the hind margin of the fore wing. Expanse 1.25–1.60 inch.

Ranges from New England to Honduras, east of the Rockies.

(4) *Terias elathea* (Cramer), Plate CIX, Fig. 2, ♂ (The Florida Yellow). (See Plate on p. 184.)

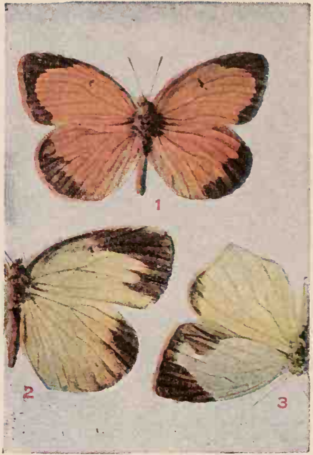
May be told from the next two species by the white hind wings. Expanse 1.25–1.40 inch.

Found in Florida, Mexico, and the Antilles.

(5) *Terias delia* (Cramer), Plate CX, Fig. 1, ♂; Fig. 2, ♀ (The Gulf Yellow). (See Plate on p. 185.)

PL. CVII

PL. CVIII



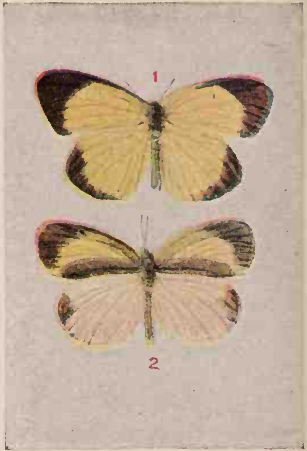
Almost exactly like the preceding species, but the hind wings are yellow above and red below, and the apex of the fore wing is red below. Expanse 1.25–1.50 inch.

Common in the Gulf States.

This species and the one preceding and following are very closely related but perfectly distinct. They are apt to puzzle the beginner, but by comparison he will soon learn to discriminate them.

(6) *Terias jucunda* (Boisduval & Leconte), Plate CX, Fig. 3, ♂ (The Fairy Yellow).

PL. CIX



Separable from the preceding species by the black border surrounding the hind wing, and the pale under surface. Expanse 1.60–1.75 inch.

Found in the Gulf States.

(7) *Terias proterpia* (Fabricius), Plate CX, Fig. 4, ♂ (The Cadmium Orange).

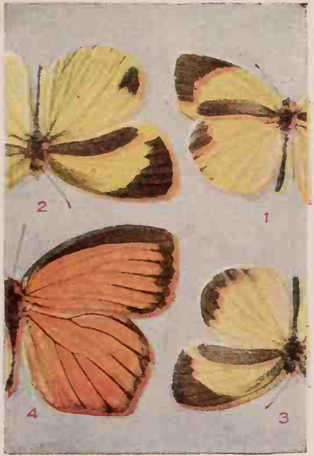
Our figure will enable the student to immediately recognize it. Expanse 1.50–1.75 inch.

Found in Texas, Arizona, and Mexico.

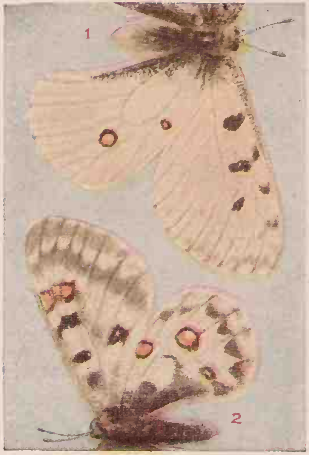
SUBFAMILY PARNASSIINÆ
(THE PARNASSIANS).

This peculiar group of butterflies is classed with the Papilionidæ because the internal vein of the hind wings is always wanting, a characteristic of all papilionine genera. The caterpillars are not provided with osmateria, or offensive scent-organs, and pupation takes place upon the ground among loosely scattered leaves which are interwoven by the larva with a few loose strands of silk. The insects are mainly inhabitants of the mountain regions of the northern hemisphere.

PL. CX



PL. CXI



GENUS PARNASSIUS LATREILLE
(THE PARNASSIANS).

What has been said of the family will suffice to characterize the genus.

(1) *Parnassius smintheus* Doubleday & Hewitson, Plate CXI, Fig. 1, ♂; Fig. 2, ♀ (The Colorado Parnassian).

This is a somewhat variable species, but may easily be recognized by the figures we give. Expanse ♂, 2.00–2.50; ♀, 2.25–3.00 inches.

Ranges from New Mexico and Colorado west to California and north to Montana. The caterpillar feeds upon *Sedum* and *Saxifraga*.

SUBFAMILY PAPILIONINÆ
(THE SWALLOW-TAILS).

Large butterflies. As shown on Plate A, Fig. 10, the hind wings lack the internal vein, its place being held by the submedian vein. There is great diversity of form in this group. Many species are tailed, as are the three occurring in Europe, and the name common in England has come in popular phrase to be loosely applied to the whole genus.

There are many hundreds of species and varietal forms, most of which occur in the tropics of the eastern and western hemispheres. There are only three species found in all Europe; there are about thirty found in the United States and Canada.

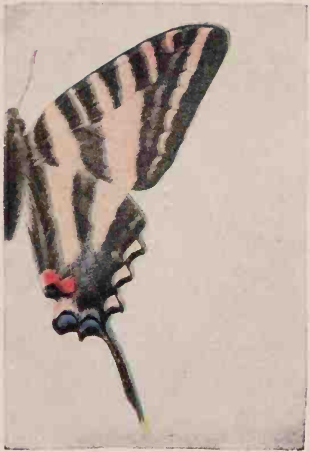
Genus PAPILIO Linnæus
(The Swallow-tails).

This great genus has been subdivided for purposes of classification into a number of smaller groups or subgenera, which are useful when dealing with the whole assemblage of species, but which in a manual like this, dealing with only a few forms, may consistently be overlooked.

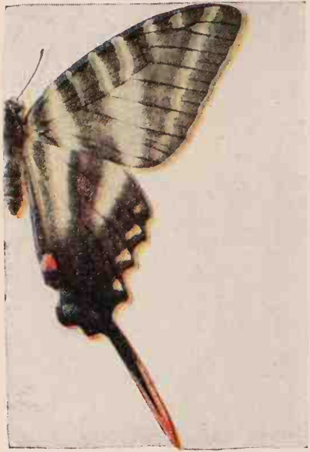
(1) *Papilio ajax* Linnæus. Winter form *walshi* Edwards, Plate CXII, ♂; summer form *marcellus* Boisduval, Plate CXIII, ♂ (The Papaw Butterfly).

The species is more or less polymorphic. Plate CXII represents the form which emerges in the spring of the year from chrysalids which have overwintered; Plate CXIII shows the form which appears in the second brood and in which the tails

PL. CXII



PL. CXIII



are twice as long as in the first. There are other forms. Expanse 2.50–3.25 inches.

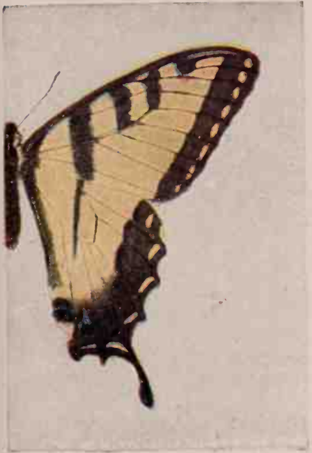
The caterpillar feeds upon the leaves of the Papaw (*Asimina triloba*) and wherever this plant grows the insect may be found. It ranges from New England and Ontario to Florida and far westward through the valley of the Mississippi.

(2) *Papilio turnus* Linnæus, Plate CXIV, ♂; Plate CXV, *P. glaucus* Linnæus, dark dimorphic ♀, *under side* (The Tiger Swallow-tail).

In the Middle States and southward a large proportion of the females are black, belonging to the form *glaucus;* in Ontario and northward and westward to Alaska the females are yellow, like the males. The Alaskan form is very small, dwarfed by the cold and poor feeding. The figure on Plate CXIV is that of a male from Alaska of the natural size; a specimen taken in Pennsylvania would be nearly twice as large. The metropolis of the species is the Appalachian uplift; but it ranges northwestward to Alaska and south to the Gulf States. Expanse 3.00–5.00 inches.

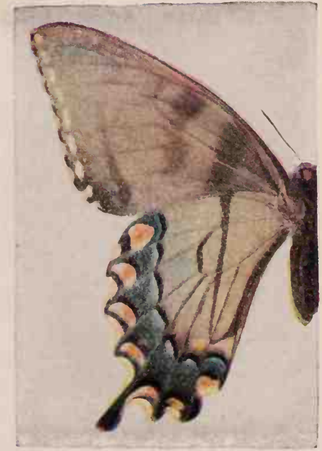
The caterpillars are partial to the foliage of wild cherry trees, but are found on a great variety of plants.

PL. CXIV

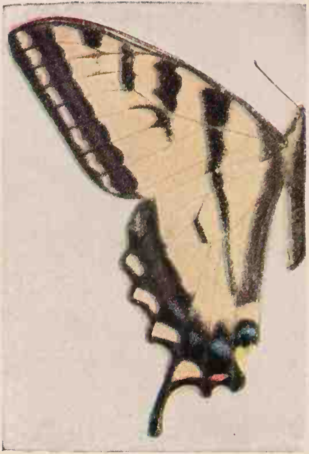


The dark female form reveals its relationship to the paler form by the stripes on the under side. On the upper side the insect shown on Plate CXV is very black and shows no stripes at all. I possess females with yellow wings on one side and black on the other. The identity of the forms named by Linnæus *turnus* and *glaucus* could not be more forcibly shown than by these specimens in which the two are united by the vital force which called them into being.

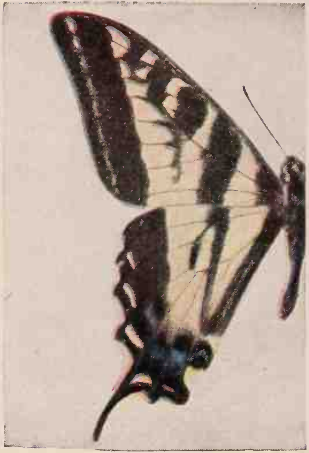
PL. CXV



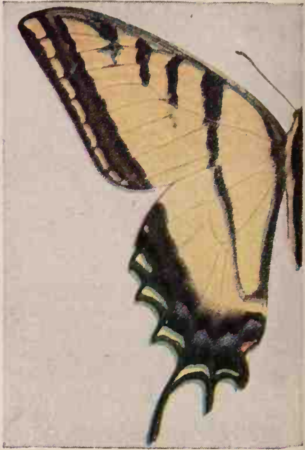
PL. CXVI



PL. CXVII



PL. CXVIII



(3) *Papilio rutulus* Boisduval Plate, CXVI, ♂ (The Pacific Tiger).

Closely resembling *P. turnus*, which it replaces on the Pacific Coast in Washington and southward. The female is never dimorphic; the marginal light spots on the under side of the fore wings run together forming a continuous band, and are not separate as in *P. turnus*. Expanse 3.50–4.25 inches.

The larva feeds on alder and willows.

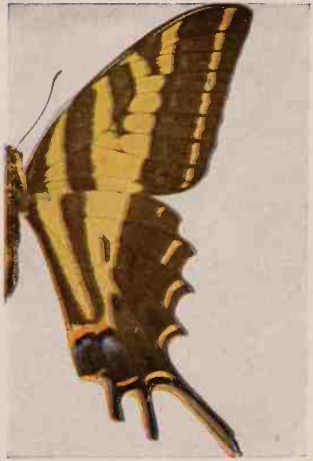
(4) *Papilio eurymedon* Boisduval, Plate CXVII, ♂ (The White-striped Tiger).

Belonging to the same group as the two preceding species, but distinguished by the pale creamy white color of the ground-color of the wings, and by the fact that the submarginal spots on the under side of the fore wings form, as in *P. rutulus*, a continuous band. Expanse 3.50–4.00 inches.

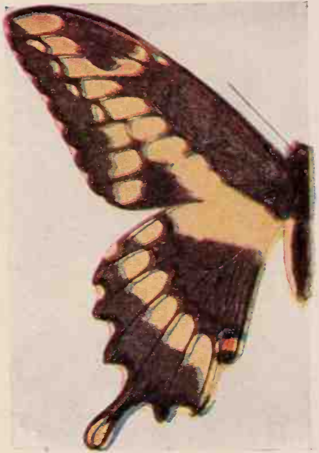
The caterpillar feeds on *Rhamnus californicus* and other plants. The insect ranges from Mexico to British Columbia and eastward to Colorado.

(5) *Papilio daunus* Boisduval, Plate CXVIII, ♂ (The Two-tailed Swallow-tail).

PL. CXIX



PL. CXX



This fine insect is even larger than *P. turnus*, which it somewhat resembles, but from which it can at once be distinguished by the two tails on the hind wings, followed by a lobe at the anal angle. Expanse 4.00–5.25 inches.

Found in the region of the Rocky Mountains from Idaho south to Mexico, but not found west of the Sierra Nevada and Coast Ranges in California.

(6) *Papilio pilumnus* Boisduval, Plate CXIX, ♂ (The Three-tailed Swallow-tail).

Easily recognized from our figure. The lobe at the anal angle is so much produced as to give the hind wing the appearance of having three tails. Expanse 3.80–4.30 inches.

A Mexican species which occasionally is found in Arizona. It is one of the most beautiful species of the group to which it belongs and is rare in collections.

(7) *Papilio cresphontes* Cramer, Plate CXX, ♀ (The Giant Swallow-tail).

One of the largest and most showy species of the genus found in our territory. The caterpillar feeds upon *Ptelea*, *Xanthoxylon*, and *Citrus*. It has a wide range from southern Ontario to Florida and through the Mississippi Valley to Mexico. Expanse 3.75–5.50 inches.

(8) *Papilio troilus* Linnæus, Plate CXXI, ♂ (The Spice-bush Swallow-tail).

The caterpillar, which is green, with two big eye-spots on the back a little behind the head, lives on the foliage of the sassafras and spice-wood, where it folds together a leaf, in which it conceals itself from view during the daytime, coming out to feed at night. The insect is found throughout the eastern United States and the Mississippi Valley, wherever its food-plant occurs. Expanse 3.75–4.25 inches.

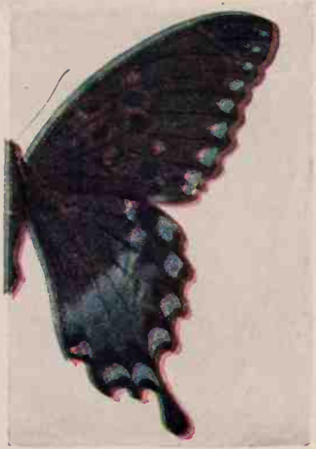
(9) *Papilio palamedes* Drury, Plate CXXII, ♂ (The Magnolia Swallow-tail). (See next page.)

The upper side of this fine insect is well shown on our plate; the under side is prevalently yellow. The larva feeds on the foliage of *Magnolia glauca* and the *Lauraceæ*. Expanse 3.50–4.50 inches.

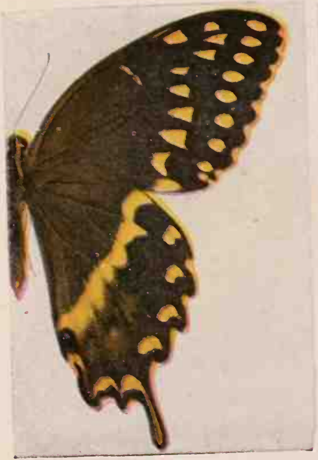
Ranges from southern Virginia near the coast to the extreme southern end of Florida and westward to southern Missouri and eastern Texas.

(10) *Papilio polyxenes* Fabricius, Plate CXXIII, ♂ (The Eastern Swallow-tail). (See next page.)

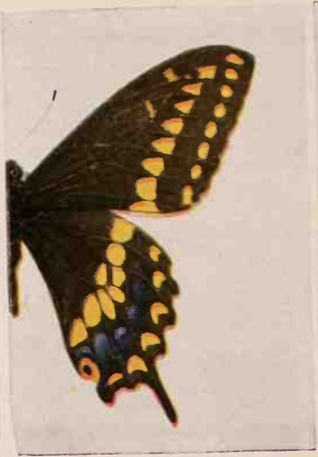
PL. CXXI



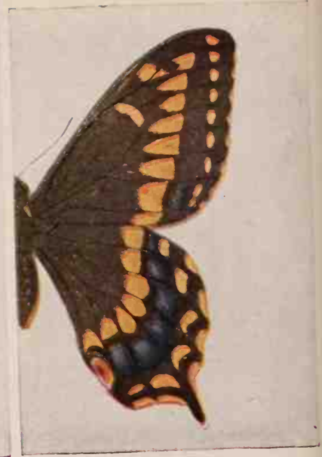
PL. CXXII



PL. CXXIII

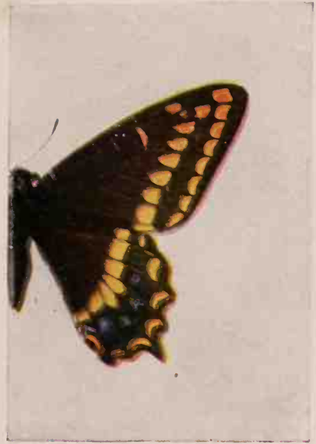


PL. CXXIV



This butterfly and the three which follow belong to a group of the genus which in England is represented by *P. machaon* of the fens of Cambridgeshire and Norfolk. There are many species evidently derived in past time from common stock, which are found in America, and the writer believes that the original centre of dispersion was this continent, and that the English Swallow-tail represents the most western range of the migration, which probably began in Tertiary times, when the horse, the camel, and other North American animals passed over into Asia and became subsequently extinct in the land of their origin. *P. machaon* still exists in Alaska as the variety *P. aliaska* Scudder.

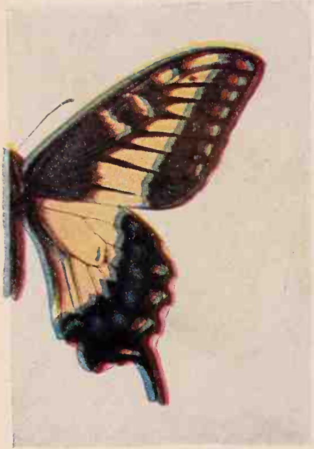
P. polyxenes, more commonly known by its later name *P. asterius*, or *P. asterias*, is found all over the Atlantic States and the Mississippi Valley. The caterpillar feeds upon umbelliferous plants, and is very partial to fennel. Expanse 2.75–3.25 inches.



(11) *Papilio brevicauda* Saunders, Plate CXXIV, ♀ (The Newfoundland Swallow-tail).

There are two forms, one found on Anticosti, in which the spots on the upper side of the wings are bright yellow, the

PL. CXXVI



other in which they are more or less red in color. The latter form is common in Newfoundland, and is shown in the Plate. Closely related to *P. polyxenes*, but with shorter tails. Expanse 2.75–3.00 inches.

(12) *Papilio indra* Reakirt, Plate CXXV, ♂ (The Mountain Swallow-tail).

The resemblance to *P. polyxenes* is marked, but it will be observed that the tails have undergone even greater reduction in length than in *P. brevicauda*, and that the band of yellow spots traversing the wings has been reduced in width. Expanse 2.50–2.75 inches.

Found on the high mountains of Colorado, Nevada, and California.

(13) *Papilio zelicaon* Boisduval, Plate CXXVI, ♂ (The Western Swallow-tail).

In many respects like *P. polyxenes*, but having the median bands of yellow greatly widened, until on the hind wing the band covers almost the entire basal half of the wing. Expanse 2.75–3.25 inches.

Ranges from Vancouver Island to Arizona and eastward as far as Colorado.

(*Note.* The name *zolicaon*, often given by authors, must be replaced by the original name *zelicaon.)*

(14) *Papilio philenor* Linnæus, Plate CXXVII, ♂ (The Pipe-vine Swallow-tail).

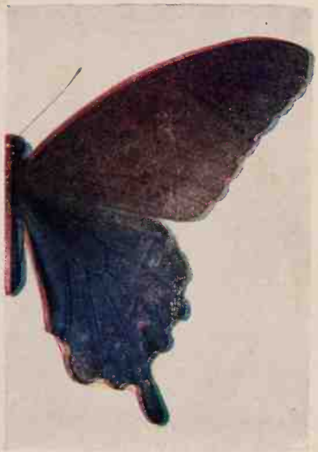
The caterpillar feeds upon the foliage of *Aristolochia sipho*, or the "Dutchman's Pipe," a plant extensively grown about verandas and porches, and native to the Allegheny Mountains. It also eats the leaves of *Aristolochia serpentaria*, a smaller plant of the same genus. The wings have an expanse of 3.75–4.25 inches.

The range is from Massachusetts to California and south into Mexico.

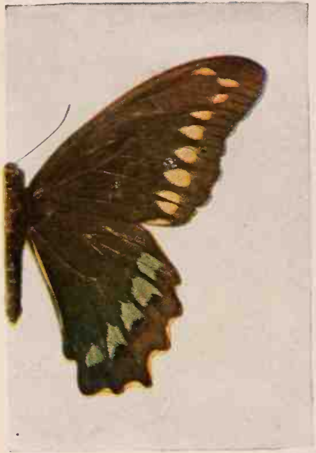
(15) *Papilio polydamas* Linnæus, Plate CXXVIII, ♂ (The Reef Butterfly). (See Plate on p. 198.)

This is the sole representant in our fauna of a great group of splendid butterflies peculiar to the tropics of the New World, which are true papilionids, but without tails, their wings generally of some shade of green, and wonderfully adorned with spots of other colors, generally yellow or crimson. It may

PL. CXXVII



PL. CXXVIII



easily be recognized from our figure. Expanse 3.00–3.50 inches.

It is found in the extreme southern part of Florida and on the adjoining reefs. It also has a wide range through the Antilles, Mexico, and Central America.

Family HESPERIIDÆ (The Skippers)

Generally quite small *butterflies*, with stout thorax. Both sexes have six feet adapted to walking. Tibiæ of hind legs, with few exceptions, have spurs. Lower radial of hind wing in many genera wanting, being represented by a fold in the wing. *Eggs* hemispherical, flat on base. *Larvæ* cylindrical tapering from the middle before and behind, with large globular heads, smooth. *Chrysalids* generally formed on the ground or among leaves and rubbish lightly tacked together with a few strands of silk, in which the cremaster is caught.

A large family, most numerously represented in the tropics of both the Old and New Worlds. About three thousand species are known, of which over one hundred occur within our limits.

SUBFAMILY PYRRHOPYGINÆ
(THE RED-TAILED SKIPPERS).

Rather large butterflies when compared with others in the family. The antennæ terminate in a long, thick, blunt club, forming a regular curve, looking in outline like the handle of an old-fashioned walking-stick. Most of the species are red at the end of the abdomen. Confined to the New World. Only one genus and species of this family occurs within our borders.

GENUS PYRRHOPYGE HÜBNER

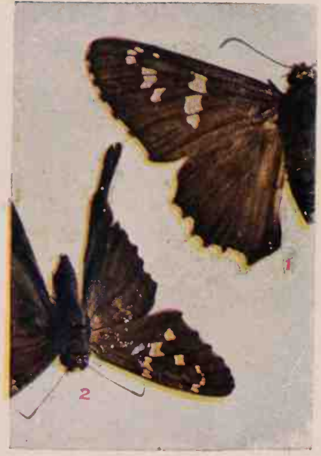
(1) *Pyrrhopyge araxes* Hewitson, Plate CXXIX, Fig. 1, ♂. Upper side correctly shown in our figure. Below the wings are prevalently yellow. Expanse 2.25–2.50 inches.

Found in Texas, Arizona, and southward.

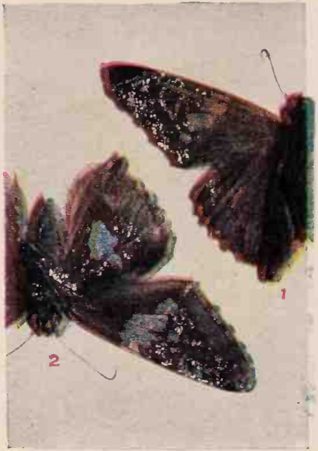
SUBFAMILY HESPERIINÆ (THE HESPERIDS)

Fore wing generally provided with a costal fold, but never marked with a sexual brand or raised patch of scales on the disk. The hind wing may be provided with a lengthy tail or simply lobed at the anal angle. Antennæ terminating in a

PL. CXXIX



PL. CXXX



fine point, which in some genera is bent backward at right angles to the shaft.

Genus EUDAMUS Swainson

(The Long-tailed Skippers).

Hind wings more or less produced at the anal angle in the form of a long tail. There are a number of species found in Central and South America.

(1) *Eudamus proteus* (Linnæus), Plate CXXIX, Fig. 2, ♀ (The Long-tailed Skipper). (See p. 199.)

The caterpillar feeds upon *Wistaria* and various leguminous plants. Common in Florida, the American tropics, and occasionally found as far north as New York.

Genus EPARGYREUS Hübner

(1) *Epargyreus tityrus* (Fabricius), Plate CXXX, Fig. 1, ♂; Fig. 2, , *under side* (The Silver-spotted Skipper).

A very common and beautiful insect. Expanse 1.75–2.00 inches.

The caterpillar usually feeds upon *Robinia* and *Wistaria*.

Has a wide range from Quebec to Vancouver Island and south to the Isthmus of Panama.

GENUS THORYBES SCUDDER
(THE DUSKY-WINGS).

(1) *Thorybes pylades* Scudder, Plate CXXXI, Fig. 1, ♀ (The Northern Dusky-wing).

Below wings dark brown shading into gray outwardly; hind wings crossed by irregular brown bands; spots of upper side reappearing below. Expanse 1.60 inch.

Common in New England, thence westward and southward.

(2) *Thorybes bathyllus* (Smith & Abbot), Plate CXXXI, Fig. 2 (The Southern Dusky-wing).

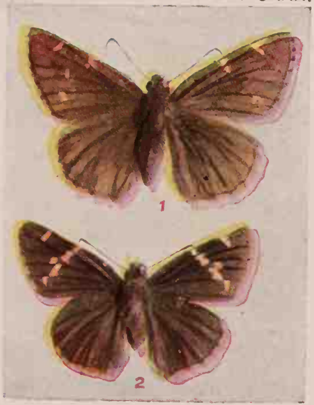
Distinguished from preceding species by the larger spots on fore wing.

Ranges from Connecticut to Texas.

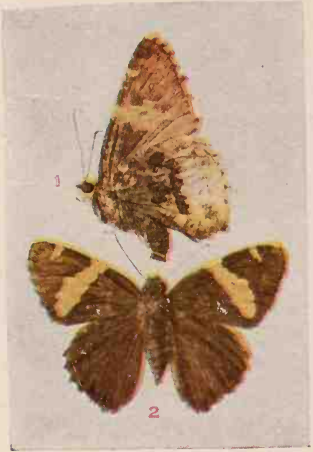
GENUS ACHALARUS SCUDDER

(1) *Achalarus lycidas* (Smith & Abbot), Plate CXXXII, Fig. 1, ♀ (The Hoary-edge).

PL. CXXXI



PL. CXXXII



Upper side strongly recalls *E. tityrus* but the hoary edge of the hind wings and the absence of the silvery spots found in *tityrus* at once separate the two. Expanse 1.65–1.95 inch.

Rare in southern New England, common in Southern States as far west as Texas.

(2) *Achalarus cellus* (Boisduval & Leconte), Plate CXXXII, Fig. 2, ♂ (The Golden-banded Skipper).

On upper side as shown in our figure; on under side hind wings banded as in *E. proteus*, no silver spots. Expanse 2.00 inches.

Found in the Virginias and southward to Arizona and Mexico.

Genus HESPERIA Fabricius

(1) *Hesperia tessellata* Scudder, Plate CXXXIII, Fig. 1, ♂ (The Tessellated Skipper).

Paler on under side than on upper side, with spots enlarged. Expanse 1.00–1.35 inch.

Ranges from Canada to the Gulf and from the Atlantic to the Pacific.

(2) *Hesperia centaureæ* Rambur, Plate CXXXIII, Fig. 2, ♂ (The Grizzled Skipper).

Below darker than preceding species, white circle at end of cell surrounding black spot, thus forming an eye-like spot; hind wings below brown scaled with green, crossed by three bands of quadrate spots. Expanse 1.15 inch.

Found in northern Europe and Asia and from Alaska to Labrador; extending south on the high mountains both in the West and in the Carolinas.

(3) *Hesperia xanthus* Edwards, Plate CXXXIII, Fig. 3, ♂ (The Checkerling).

Resembling *H. tessellata*, but much smaller and darker at base of wings, spots more crowded. Expanse 1.00 inch.

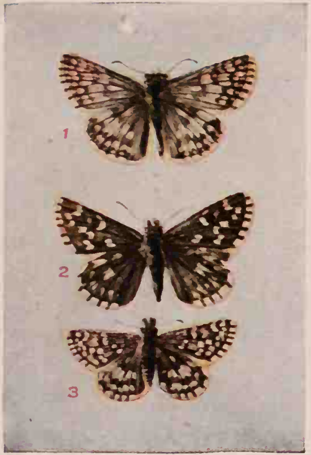
Found in Colorado and Rocky Mountains to west and south.

GENUS PHOLISORA SCUDDER
(THE SOOTY-WING).

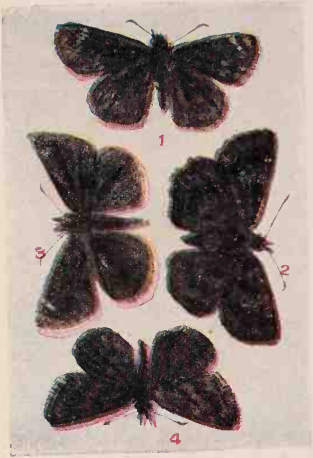
(1) *Pholisora catullus* (Fabricius), Plate CXXXIV, Fig. 1, ♀ (The Common Sooty-wing).

Easily recognizable by means of our figure. Expanse 0.80-1.15 inch.

PL. CXXXIII



PL. CXXXIV



The caterpillar feeds on "lamb's-quarter" (*Chenopodium*). Ranges over all temperate North America.

(2) *Pholisora hayhursti* (Edwards), Plate CXXXIV, Fig. 2, ♀ (Hayhurst's Sooty-wing)

Easily distinguished from preceding by white color of under side of abdomen as well as by the different arrangement of spots on fore wing. Expanse 0.90–1.15 inch.

Ranges from Pennsylvania to the Gulf as far as the Rocky Mountains.

(3) *Pholisora lybia* Scudder, Plate CXXXIV, Fig. 3, ♂ (The Mohave Sooty-wing).

Distinguished from the two preceding by the white fringes of the wings and by the markings of the upper side. Expanse 0.80–1.40 inch.

Found from western Texas to Nevada and Arizona.

(4) *Pholisora alpheus* (Edwards), Plate CXXXIV, Fig. 4, ♂ (New Mexican Sooty-wing).

More checkered on the upper side than the other species, tip of fore wing white. Expanse 0.95–1.00 inch.

Ranges from New Mexico to Arizona.

GENUS THANAOS BOISDUVAL
(THE DUSKY-WINGS).

(1) *Thanaos brizo* Boisduval & Leconte, Plate CXXXV, Fig. 1, ♀ (The Sleepy Dusky-wing)

The two rows of light yellow spots on the outer margin of the hind wings appear more distinctly on the under side. Expanse 1.25–1.60 inch

Larva feeds on oaks and other plants. Ranges from the Atlantic to the Pacific, from New England to Florida and Arizona.

(2) *Thanaos icelus* Lintner, Plate CXXXV, Fig. 2, ♂ (The Dreamy Dusky-wing).

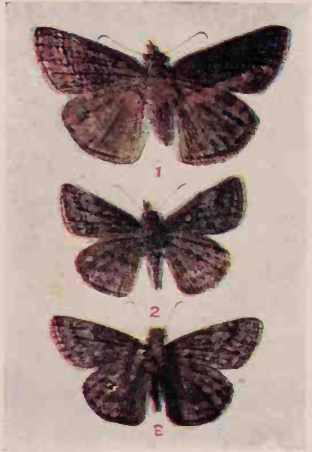
Under side paler than upper, marked with many small, indistinct yellow spots, not forming well-defined bands as in preceding species. Expanse 1.00–1.20 inch.

Caterpillar feeds on aspen, oaks, and witch-hazel. Ranges from Nova Scotia to Oregon, south to Florida and Arizona.

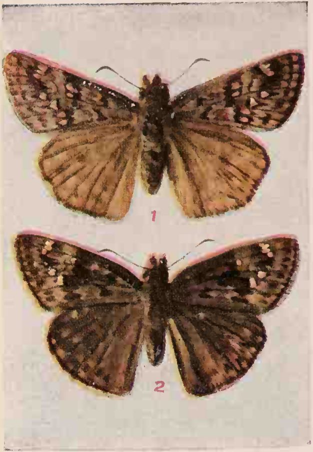
(3) *Thanaos lucilius* Lintner, Plate CXXXV, Fig. 3, ♂ (Lucilius' Dusky-wing).

Closely related to preceding, but distinguished by more

PL. CXXXV



PL. CXXXVI



regularly checkered fringes of the fore wing and the different arrangement of the spots on the under side. Expanse 1.20–1.40 inch.

Larva feeds on columbine (*Aquilegia*). Ranges from New England to Georgia, and westward through the valley of the Mississippi.

(4) *Thanaos juvenalis* (Fabricius), Plate CXXXVI, Fig. 1, ♀ (Juvenal's Dusky-wing).

A large species with translucent spots arranged as an interrupted band beyond middle of wing. Expanse 1.35–1.60 inch.

Ranges from Quebec to Florida and westward to Arizona.

(5) *Thanaos petronius* Lintner, Plate CXXXVI, Fig. 2, ♂ (Petronius' Dusky-wing).

Somewhat resembling the preceding, but translucent spots much fewer in number and upper side much darker. Under side uniformly dusky with few light spots. Expanse 1.50–1.75 inch.

Confined to Florida so far as known.

(6) *Thanaos martialis* Scudder, Plate CXXXVII, Fig. 1, ♂ (Martial's Dusky-wing).

Upper side paler than in most species, with a purplish gray cast, all light spots of upper side repeated more distinctly on under side. Expanse 1.25–1.40 inch.

Ranges from Massachusetts to Georgia, westward to Missouri and New Mexico.

(7) *Thanaos horatius* Scudder, Plate CXXXVII, Fig. 2, ♂ (Horace's Dusky-wing).

Smaller than *T. juvenalis*, which it resembles; paler above on both wings, below more profusely mottled on hind wings. Expanse 1.65 inch.

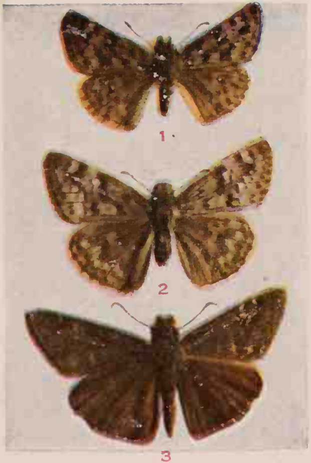
Ranges from Massachusetts to Texas.

(8) *Thanaos funeralis* Lintner, Plate CXXXVII, Fig. 3, ♂ (The Funereal Dusky-wing).

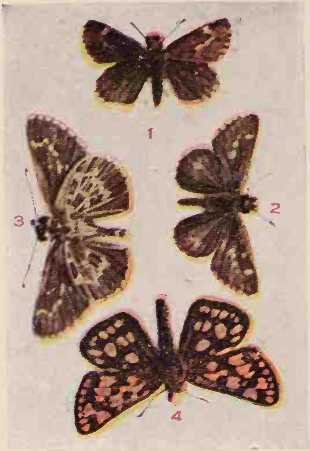
Hind wings very dark, partly fringed with pure white. Expanse 1.35 inch.

Found from western Texas to Mexico.

PL. CXXXVII



PL. CXXXVIII



SUBFAMILY PAMPHILINÆ (THE PAMPHILIDS)

The male never has a costal fold on the fore wing, but in most of the genera has a discal stigma on the fore wing, the only exceptions to this in our fauna being in the case of the three genera *Amblyscirtes, Pamphila,* and *Oarisma.* The antennæ are short, in some genera very short, clubbed at the end and provided in many genera with a little finely pointed tip at the end of the club, which sometimes is bent backward. The third joint of the palpi is generally small, inconspicuous, and often pointing forward. The lower radial in the fore wing always is nearer to the median than to the upper radial; the lower radial in the hind wing is generally lacking. When at rest they raise the fore wings, folding them together, while the hind wings are held horizontally. This attitude is characteristic of this subfamily.

GENUS AMBLYSCIRTES SCUDDER

(1) *Amblyscirtes vialis* (Edwards), Plate CXXXVIII, Fig. 1, ♂ (The Roadside Skipper).

Wings below much as on upper side, except that outwardly they are lightly laved with gray. Expanse 1.00 inch.

Ranges from Canada to Florida, and from the Atlantic to the Pacific.

(2) *Amblyscirtes samoset* (Scudder), Plate CXXXVIII, Fig. 2, ♂ (The Pepper-and-Salt Skipper). (See Plate on p. 208.)

Below wings pale gray, the light spots of upper side reappearing. Hind wing marked by semicircular median band of white spots, a small spot at end of cell, and conspicuous white spot about middle of costa. Expanse 1.00–1.10 inch.

Ranges from Maine to Michigan and south on the Allegheny Mountains to West Virginia.

(3) *Amblyscirtes textor* (Hubner), Plate CXXXVIII, Fig. 3, ♂, *under side* (The Woven-winged Skipper). (See Plate on p. 208.)

Easily recognized by means of our figure. Expanse 1.25–1.45 inch.

Ranges from North Carolina to Florida and westward to Texas.

GENUS PAMPHILA FABRICIUS

(1) *Pamphila mandan* Edwards, Plate CXXXVIII, Fig. 4, ♂ (The Arctic Skipper).

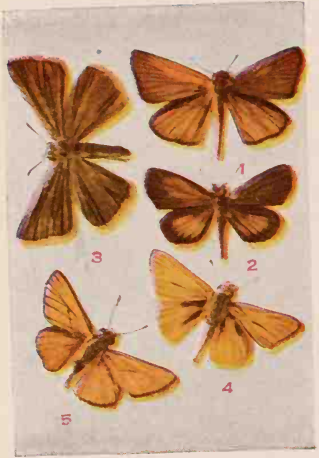
Recognizable from our figure. It is totally unlike any other species in the fauna. Expanse 1.10 inch.

Found from Labrador to Alaska, and on the mountains of Idaho and Montana.

GENUS OARISMA SCUDDER

(1) *Oarisma garita* (Reakirt), Plate CXXXIX, Fig. 1, ♂ (The Little Dun). (See Plate on p. 210.)

PL. CXXXIX



On the under side both wings are somewhat brighter than on the upper side, the hind wings inclining to leaden gray, with the inner margin bright fulvous. Expanse 0.75–1.00 inch.

Ranges from southern Colorado to Arizona.

(2) *Oarisma powesheik* (Parker), Plate CXXXIX, Fig. 3, ♂ (The Iowa Dun).

Larger than the preceding species and dark on upper side; on under side fore wings black, edged on costa with light fulvous. Hind wings dusky below, veins and nervules white, conspicuous on darker ground. Expanse 1.00–1.25 inch.

Ranges from Wisconsin to Dakota and Colorado, common in Iowa.

GENUS ANCYLOXYPHA FELDER

(1) *Ancyloxypha numitor* Fabricius, Plate CXXXIX, Fig. 2, ♂ (The Least Skipper).

Below fore wings black, bordered on costa and outer margin with reddish fulvous; hind wings pale fulvous. Expanse 0.75–0.95 inch.

Ranges from Quebec to Florida and westward to the Rocky Mountains.

GENUS COPŒODES SPEYER

(1) *Copæodes procris* (Edwards), Plate CXXXIX, Fig. 4, ♂ (The Golden Skipper).

Below wings as on upper side, a trifle paler than on the upper side. The fore wings blackish on inner margin near base. Expanse 0.80–1.00 inch.

Ranges from southern Texas to southern California.

(2) *Copæodes wrighti* (Edwards), Plate CXXXIX, Fig. 5, ♂ (Wright's Skipper).

Distinguished from *C. procris* by dark fringes on both wings and different arrangement of stigma on fore wings. Expanse 0.85–1.07 inch.

Found in southern California and eastward as far as eastern Arizona.

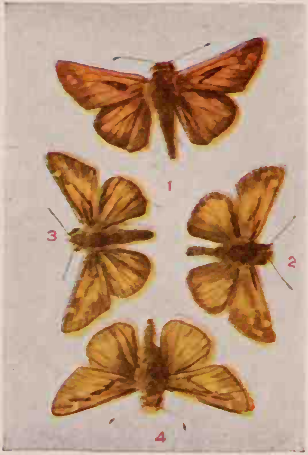
GENUS ERYNNIS SCHRANK

(1) *Erynnis manitoba* (Scudder), Plate CXL, Fig. 1, ♂ (The Canadian Skipper).

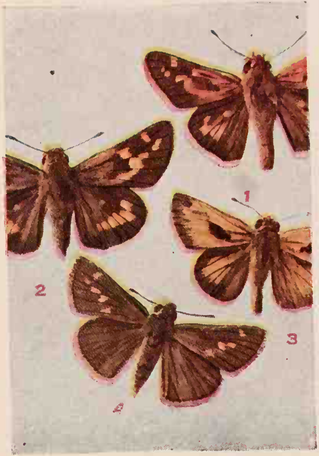
On the lower side all the light spots of the upper side reappear, but more distinctly defined and pearly white in color.

Ranges north of the boundary between the United States and the Dominion of Canada, descending into the United States

PL. CXL



PL. CXLI



as far south as Colorado and northern California upon the high mountain ranges.

(2) *Erynnis sassacus* (Harris), Plate CXL, Fig. 2, ♂ (The Indian Skipper). (See p. 211.)

Below wings pale fulvous, spots of upper side feebly reproduced as faint lighter spots; fore wings black at base on this side. Expanse 1.10–1.35 inch.

Ranges from New England to Georgia, west to Colorado.

(3) *Erynnis attalus* (Edwards), Plate CXL, Fig. 3, ♂ (The Wisconsin Skipper). (See p. 211.)

Below both wings are dusky, with the light spots appearing in faint gray. The female is darker. Expanse 1.25–1.45 inch.

Ranges from New England to Wisconsin and Iowa, thence to the region of the Gulf.

(4) *Erynnis metea* (Scudder), Plate CXL, Fig. 4, ♂ (The Cobweb Skipper). (See p. 211.)

Below wings are brown, much darker than above, the pale marks of upper side repeated as pearly white spots, and on hind wings near base is a curved band of similar white spots. Expanse 1.20–1.30 inch.

Ranges from New England to Wisconsin.

(5) *Erynnis uncas* (Edwards), Plate CXLVIII, Fig. 4, ♂ (Uncas' Skipper). (See p. 220.) Below in both sexes wings beautifully marked with pearly white spots on greenish gray ground, the spots defined inwardly and outwardly by dark olive shades. Expanse 1.30–1.55 inch.

Ranges from Pennsylvania to Montana.

(6) *Erynnis leonardus* (Harris), Plate CXLI, Fig. 1, ♂; Fig. 2, ♀ (Leonard's Skipper). Larger than most of the preceding species. Below wings dark brick-red. Spots of upper side reappearing more or less faintly. Expanse 1.25–1.35 inch.

Ranges from New England and Ontario to Florida, west throughout the Mississippi Valley.

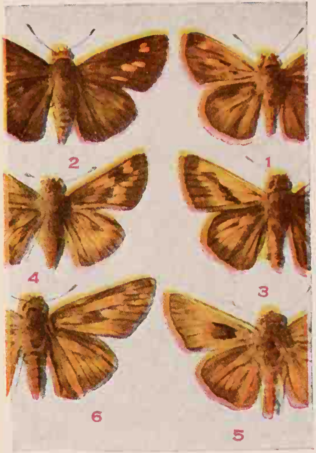
GENUS THYMELICUS HÜBNER

(1) *Thymelicus brettus* (Boisduval & Leconte), Plate CXLI, Fig. 3, ♂; Fig. 4, ♀ (The Whirlabout).

This insect, which is rare in the Northern States, is common in the South and has a wide range through the American tropics. Expanse 1.15–1.25 inch.

(2) *Thymelicus otho* (Smith & Abbot), Plate CXLII, Fig. 1, ♂; Fig. 2, ♀.

The upper side is sufficiently well shown in our plate. Below the wings are yellowish brown with outer half of the fore wings blackish; spots of fore wing repeated except last. Hind wings below with an obscure yellowish band of five or six spots. A variable species. The northern form, with fewer spots, is called *egeremet*, and is not very common in New England, PL. CXLII



but southward the species is abundant. Expanse 1.20–1.25 inch.

Found in New England, Florida, and west throughout the Mississippi Valley.

(3) *Thymelicus mystic* (Scudder), Plate CXLII, Fig. 3, ♂; Fig. 4, ♀ (The Long-dash).

Upper side of both sexes well shown in our plate. Below fore wings fulvous on costa near base; remainder of wings on this side dark ferruginous, with the light spots of the upper side repeated, greatly enlarged, pale, contrasting strongly with dark ground-color. Hind wings pale brown on inner margin. Expanse 1.10–1.25 inch.

Ranges from southern Canada to Pennsylvania and west to Wisconsin.

GENUS ATALOPEDES SCUDDER

(1) *Atalopedes huron* (Edwards), Plate CXLII, Fig. 5, ♂; Fig. 6, ♀ (The Sachem).

Easily distinguished from the figures we give. Expanse 1.15–1.35 inch.

Ranges from New York to Florida, westward and southwestward into Mexico.

Genus POLITES Scudder

(1) *Polites peckius* (Kirby), Plate CXLIII, Fig. 1, ♂; Fig. 2, ♀ (Peck's Skipper).

This small species is dark brown below, with the light spots of the upper side reappearing, greatly enlarged, especially in the middle of the wings, fused together and pale yellow, thus contrasting strongly with the rest of the wings. Expanse 1.00–1.25 inch.

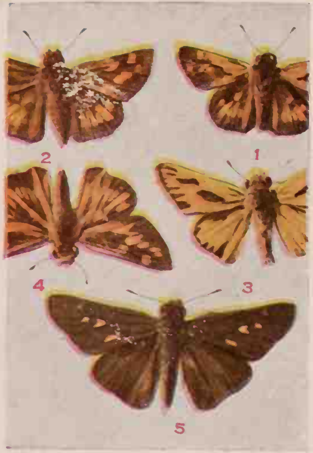
Peck's Skipper ranges from Canada to Virginia west to Kansas and Iowa.

Genus HYLEPHILA Billberg

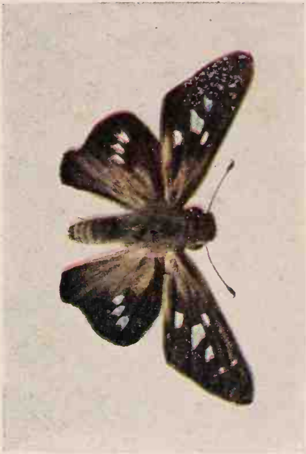
(1) *Hylephilahy plæus* (Drury), Plate CXLIII, Fig. 3, ♂; Fig. 4, ♀ (The Fiery Skipper).

Easily recognized from our figures. Expanse 1.15–1.25 inch.
Ranges from Connecticut to Patagonia everywhere.

PL. CXLIII



PL. CXLIV



GENUS PRENES SCUDDER.

(1) *Prenes ocola* (Edwards), Plate CXLIII, Fig. 5, ♂ (The Ocola Skipper). (See p. 215.)

This common southern species, which sometimes ranges as far north as the latitude of Pennsylvania, ranges south as far as Bolivia in South America. Expanse 1.45–1.60 inch.

The figure is that of the type.

GENUS CALPODES HÜBNER

(1) *Calpodes ethlius* (Cramer), Plate CXLIV, ♂ (The Brazilian Skipper).

Easily recognized from our plate. Wings below dull olive. Expanse 2.00–2.15 inches.

The larva feeds on *Canna*. Common everywhere in tropical America and has been known to stray as far north as New York.

GENUS LERODEA SCUDDER

(1) *Lerodea eufala* (Edwards), Plate CXLIX, Fig. 3, ♂ (The Eufala Skipper). (See p. 221.)

On the wing looks like a small specimen of *Prenes ocola*, from which it may be distinguished at once by the white under side of the abdomen. Expanse 1.10–1.20 inch.

Not uncommon in Florida.

Genus LIMOCHORES Scudder

(1) *Limochores thaumas* (Fabricius), Plate CXLV, Fig. 1, ♂; Fig. 2, ♀ (The Fawn-edged Skipper).

Easily distinguished by means of our figures. Below in both sexes wings dull olive, with spots of upper side repeated; costa of male edged with red on this side as well as above. Expanse 1.00–2.07 inches.

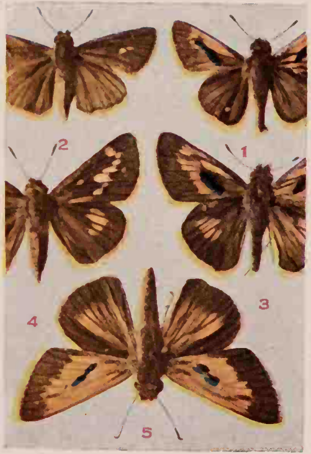
Ranges from Canada to the Gulf, west to the Rocky Mountains.

(2) *Limochores pontiac* (Edwards), Plate CXLV, Fig. 3, ♂; Fig. 4, ♀ (Pontiac's Skipper).

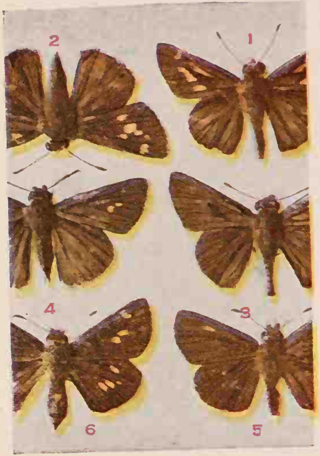
Well represented in our figures of both sexes. Expanse 1.15–1.25 inch.

Ranges from Massachusetts to Nebraska, being very common about the southern end of Lake Michigan.

PL. CXLV



PL. CXLVI



(3) *Limochores palatka* (Edwards), Plate CXLV, Fig. 5, ♂ (The Palatka Skipper). (See p. 217.)

A large and rather showy species, the female expanding as much as two inches. Expanse, ♂, 1.50 inch; ♀, 1.90–2.00 inches.

Found on Indian River, Florida.

Genus EUPHYES Scudder

(1) *Euphyes verna* (Edwards), Plate CXLVI, Fig. 1, ♂; Fig. 2, ♀ (The Vernal Skipper).

Below wings paler, inclining to purplish red, about middle of hind wings a semicircle of pale spots. Expanse 1.15–1.35 inch.

Ranges from southern New England to Virginia, west to Kansas, and north to Alberta. Very common in Ohio, Indiana, and Illinois.

(2) *Euphyes metacomet* (Harris), Plate CXLVI, Fig. 3, ♂; Fig. 4, ♂ (The Dun Skipper).

The markings of upper side reappear on lower side, the ground-color below ranging from pale brown to purplish brown. Expanse 1.15–1.30 inch.

Found from Quebec to the Carolinas, west to Texas and Alberta and Assiniboia.

GENUS POANES SCUDDER

(1) *Poanes massasoit* (Scudder), Plate CXLVI, Fig. 5, ♂; Fig. 6, ♀ (The Mulberry-wing).

Below hind wings bright yellow, bordered on costa and outer margin with reddish brown; the wings of the female not so brightly colored as those of the male. Expanse 1.15–1.20 inch.

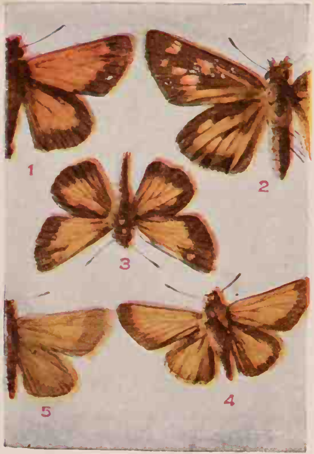
Ranging from New England to Nebraska, but not extending south of Pennsylvania in the east, though occurring in the west in Colorado and northern Texas.

GENUS PHYCANASSA SCUDDER

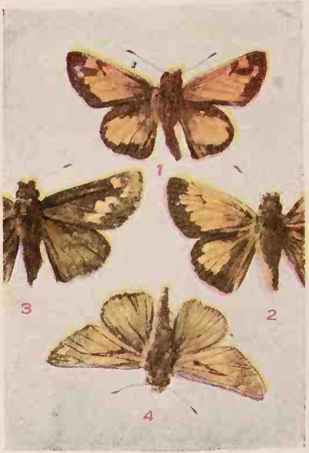
(1) *Phycanassa viator* (Edwards), Plate CXLVII Fig. 1, ♂; Fig. 2, ♀ (The Broad-winged Skipper).

Below paler than above, the light spots of the upper side reappearing less distinctly; the hind wing traversed from base to middle of outer margin by a light-colored longitudinal ray which is not as plain in the female as in the male. Expanse 1.45–1.60 inch.

PL. CXLVII



PL. CXLVIII



Rare in the Northern States from New Jersey to Wisconsin, but quite abundant in the Southern States as far west as Texas.

(2) *Phycanassa aaroni* Skinner, Plate CXLVII, Fig. 3, ♂ (Aaron's Skipper). (See p. 219.)

Below fore wings black at base, middle area tawny, paler than above, with the outlines of the borders the same, but their color cinnamon-brown, and not fuscous, as above; hind wings below uniformly cinnamon-brown, without any spots. Female like the male, but larger. Expanse 1.00–1.25 inch.

Found in the salt marshes near Cape May, New Jersey, but probably has a wider range to the south.

Genus ATRYTONE Scudder

(1) *Atrytone vitellius* (Smith & Abbot), Plate CXLVII, Fig. 4, ♂, Fig. 5, ♀ (The Iowa Skipper).

Below the wings are pale yellow, the inner margin of the fore wings clouded with brown. Expanse 1.25–1.45 inch.

Common in the Gulf States, ranging north to Iowa and Nebraska.

(2) *Atrytone zabulon* (Boisduval & Leconte), Plate CXLVIII, Fig. 1, ♂ (The Zabulon Skipper).

Very closely related to the following species from which it may be distinguished by its somewhat smaller size and the presence of the heavier dark markings at the apex of the fore wings above. Expanse 1.25–1.50 inch.

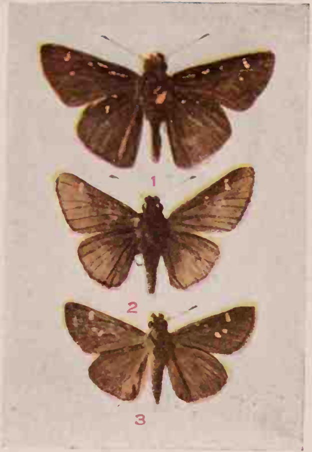
Ranges from New England to Georgia and westward to the Rocky Mountains.

(3) *Atrytone hobomok* (Harris), Plate CXLVIII, Fig. 2, ♂; variety *pocohontas* Scudder, Plate CXLVIII, Fig. 3, ♀ (The Hobomok Skipper).

In the male the small apical spots are not enclosed by a band of dark color as in the preceding species, and the pale area on the middle of the hind wings is more restricted, the inner margin of this wing being more widely fuscous. The variety of the female called *pocohontas* by Dr. Scudder is melanic, and is, as shown in our figure, very dark with conspicuous light spots in the fore wing. Expanse 1.25–1.50 inch.

Ranges from New England southward and westward over the greater part of the Atlantic region and the valley of the Mississippi.

PL. CXLIX



GENUS LEREMA SCUDDER

(1) *Lerema accius* (Smith & Abbot), Plate CXLIX, Fig. 1, ♂ (The Grimy Skipper).

The wings on the under side are dark fuscous clouded with still deeper brown or black. Expanse 1.40–1.50 inch.

Occurs from Connecticut to Central America, being quite rare in the north but very common in the hot lands of the south.

(2) *Lerema hianna* (Scudder), Plate CXLIX, Fig. 2, ♂ (The Dusted Skipper).

The upper side is well represented in our figure. On the under side the wings are a littl paler, especially the hind wings, which on their outer half are dusted with gray, in certair lights having a bluish cast. Expanse 1.15–1.25 inch.

Ranges from New England to Nebraska and southward, but, so far as the writer know not reaching the Gulf States.

SUBFAMILY MEGATHYMINÆ (THE GIANT SKIPPERS)

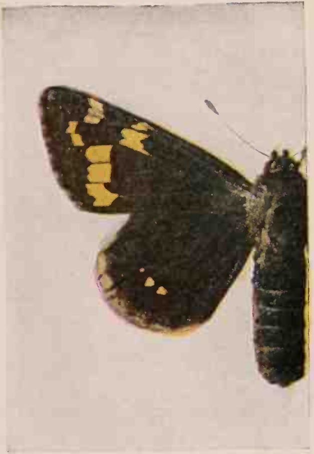
These curious insects have been by some writers placed among the *Castniidæ*, a family of day-flying moths, but as the author stated in 1898 in "The Butterfly Book," they appear to have much more in common with the Hesperiidæ than the Castniidæ. The proposition to include them in the Hesperiidæ as a subfamily under the name given above has since that time been generally accepted by systematists. There are a number of species belonging to the genus *Megathymus*, several of which occur within our faunal limits, but we shall content ourselves with figuring only the one, which those readers of this book who live in Missouri and south and west of that state are likely to see.

GENUS MEGATHYMUS RILEY

(1) *Megathymus yuccæ* (Boisduval & Leconte), Plate CL, ♀ (The Yucca Skipper).

The caterpillar of this species is a wood-borer, feeding in the pith and on the underground roots of different species of *Yucca.* The life history has been beautifully worked out by the late Prof. C. V. Riley, who published a full account of his observations in his "Eighth Annual Report of the State Entomologist of Missouri," pp. 169 *et seq.*, and in the "Transactions of the St. Louis Academy of Science," Vol. III, pp. 323 *et seq.* The student will do well to refer to these interesting papers. The figure we give on the plate is that of a female specimen bred by Professor Riley in Missouri and presented by him to the late W. H. Edwards, whose collection is now the property of the writer.

PL. CL



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